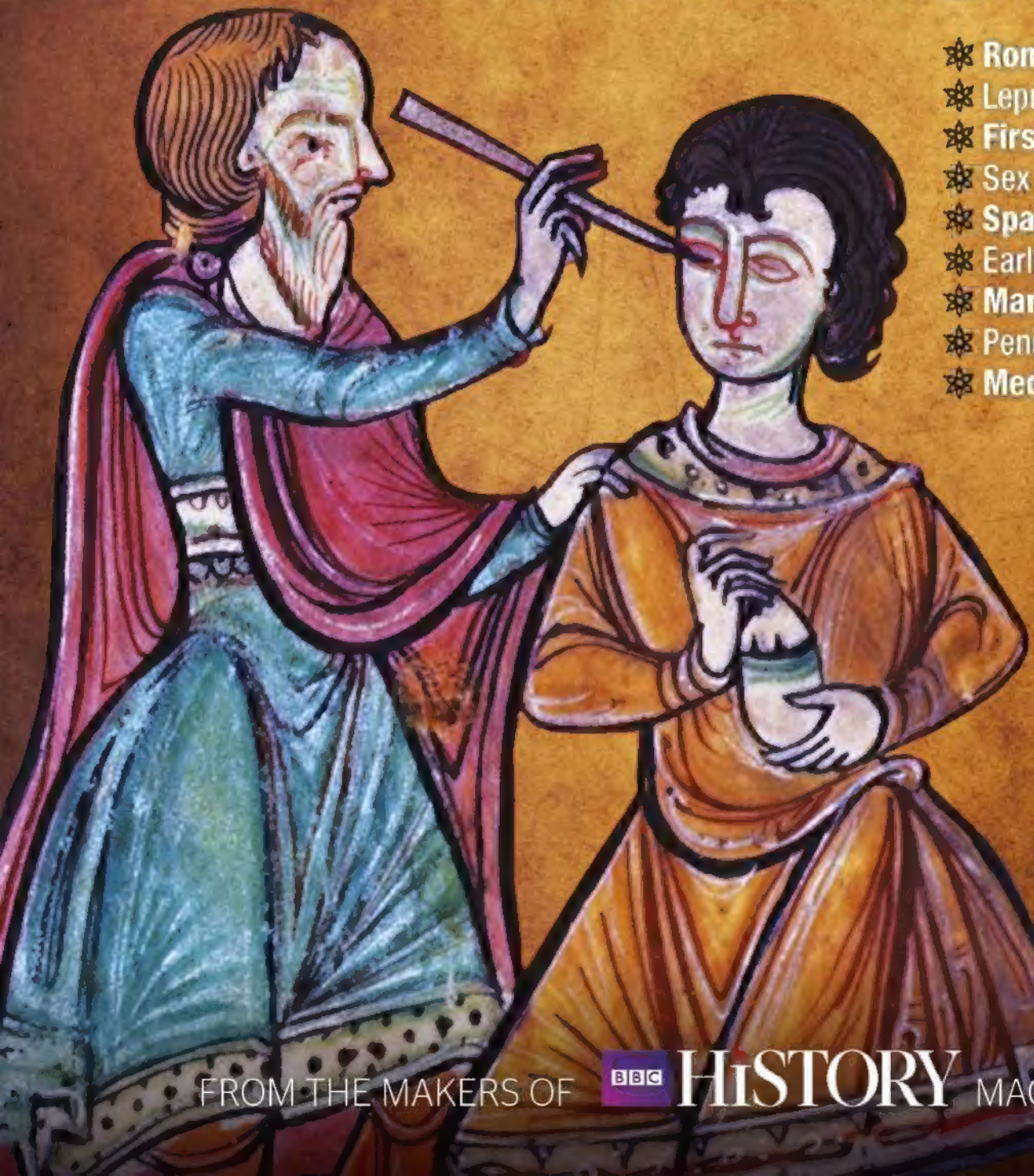
BBC

FROM THE MAKERS OF **BBC HISTORY MAGAZINE**

*Collector's Edition*

# THE STORY OF MEDICINE

## *From the **Black Death** to **Florence Nightingale***



- **Roman health**
- Leprosy & plague
- **First World War**
- Sex therapy
- **Spanish flu**
- Early surgery
- **Marie Curie**
- Penicillin
- **Medieval care**

FROM THE MAKERS OF BBC HISTORY MAGAZINE

BBC HISTORY MAGAZINE

# WELCOME

**EDITORIAL**
**Editor** Rob Attar
*robertattar@historyextra.com*
**Managing editor** Charlotte Hodgman
**Production editor** Spencer Mizen
**Sub-editor** Paul Bloomfield
**Picture editor** Samantha Nott
*samnott@historyextra.com*
**Art editor** Sarah Lambert
**Additional work by** Katherine Hallett, Matt Elton, Susanne Frank, Rachel Dickens, Rosemary Smith, Emma Mason, Ellie Cawthorne, Elinor Evans, Everett Sharp

IMMEDIATE MEDIA CO

*BBC History Magazine* is published by Immediate Media Company Bristol Limited under licence from BBC Worldwide who help fund new BBC programmes.

*BBC History Magazine* was established to publish authoritative history, written by leading experts, in an accessible and attractive format. We seek to maintain the high journalistic standards traditionally associated with the BBC.

**PRESS AND PUBLIC RELATIONS**
**Press officer** Dominic Lobley
020 7150 5015 – dominic.lobley@immediate.co.uk
**SYNDICATION**
**Director of licensing & syndication** Tim Hudson
**International Partners' Manager** Anna Brown
**PRODUCTION**
**Production director** Sarah Powell
**Production co-ordinator** Emily Mounter
**IMMEDIATE MEDIA COMPANY**
**Publisher** David Musgrove
**Publishing director** Andy Healy
**Managing director** Andy Marshall
**CEO** Tom Bureau
**BBC WORLDWIDE**
**Director of editorial governance** Nicholas Brett
**Director of consumer products and publishing** Andrew Moultrie
**Head of UK publishing** Chris Kerwin
**Publisher** Mandy Thwaites
**Publishing co-ordinator** Eva Abramik
UK.Publishing@bbc.com
www.bbcworldwide.com/uk--anz/ukpublishing.aspx


**ISSN: 1469 8552**


Nose jobs and cataract operations might seem like recent medical innovations. It may surprise you to learn, then, that nasal reconstruction and ophthalmic procedures were first undertaken at least as long ago as the sixth century BC, when they were described in Sanskrit in an early Indian medical textbook.

The history of medicine is littered with such eye-opening (and eye-healing) innovations – and this special edition looks in detail at the most groundbreaking developments and the pioneers behind them, as well as the social aspects of diagnosis and treatment.

We explore the **cures prescribed by physicians in ancient Greece and Rome**, as well as examining the medical practices of pharaonic Egypt and the work of the **midwives of antiquity**. We introduce the women and men whose work transformed clinical care and surgery: **Marie Curie**, Louis Pasteur, Florence Nightingale, Alexander Fleming and Edward Jenner, among others. We discuss the social impacts of diseases such as **leprosy**, the **Black Death** and **Spanish flu**, as well as public responses to **cures for syphilis**. We enter the gory and pain-drenched world of **18th-century surgery** and examine curious 'cures' such as a **magnetico-electrical fertility-enhancing bed**. And we trace innovations in healthcare emerging from the **First World War** and the evolution of Britain's **National Health Service**.

*The Story of Medicine* compiles and updates articles that have appeared previously in *BBC History Magazine*, along with several new articles written specially for this edition. I hope you enjoy it.

**Rob Attar**
*Editor*
**BSME Editor of the Year 2015, Special Interest Brand**

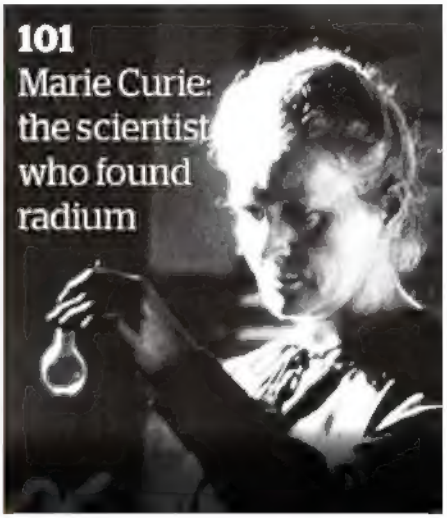

"Medical history provides countless examples of **how poorly we learn from our mistakes**"

**Medical historian GARETH WILLIAMS discusses why history is crucial to both the science and the art of medicine, on page 114**

ON THE COVER: MEDIEVAL EYE SURGERY, BRIDGEMAN. THIS PAGE: STEVE SAYERS – THESECRETSTUDIO.NET

# CONTENTS


**104** 19th-century advances that revolutionised medicine


**101** Marie Curie: the scientist who found radium



**22** Curious cures of antiquity

**6 Timeline**
Caroline Rance traces the key moments in medical history

14 **DEATH & DISEASE**

**16 Health and healing in ancient Egypt**
Carole Reeves explores diseases, diagnoses and treatments from the pharaonic era

**20 Leprosy through the ages**
Elma Brenner traces changing historical attitudes

**22 Wonder cures of the ancient world**
Laurence Totelin describes a number of memorable remedies from the distant past

**28 Marked by plague**
Mark Ormrod maps out nine British sites affected by the 14th-century outbreak

**34 The Black Death: the historians' view**
Four experts answer big questions about the medieval pestilence

**40 Call the (Roman) midwife**
Laurence Totelin on the birthing experts of antiquity

**44 Portraits of the plague**
Photos depicting the impact of the third plague pandemic

**48 The fatal flu that gripped the globe**
Laura Spinney on the devastating Spanish flu epidemic of 1918-19

52 **DIAGNOSIS & TREATMENT**

**54 7 surprising facts about the history of medicine**
Caroline Rance reveals curious examples of early healthcare

**58 Taking the sex cure**
Lydia Syson introduces the 'world's first sex therapist'

**62 Sickness, salves and skillets**
Elaine Leong delves into an 18th-century medicine cabinet

**66 The ladies with the lamps**
Mark Bostridge discusses the work of Florence Nightingale and the genesis of modern nursing


**34** Big questions about the Black Death answered



**70** Surgery in an age before anaesthetics



**109** Medical advances of the First World War



**54** Women doctors of ancient Egypt – and more medical revelations



**66** Follow Florence Nightingale and her nurses to Crimea


AKG IMAGES/SHUTTERSTOCK-ART ARCHIVE/ALAMY/MUSEUM OF LONDON


**70 Under the knife in the 18th century**
Daniel Hahn looks at the study and painful practice of surgery in the pre-anaesthesia era

**76 Medieval hospitals**
Sheila Sweetinburgh explores almshouses and institutions providing care in the Middle Ages

**80 Microbes, magic bullets and morality**
Jad Adams explains why a cure for syphilis provoked moral outrage in the early 20th century

**84 NHS: Britain's healthcare revolution**
Martin Gorsky traces the history of the National Health Service, from Bevan's vision to the present day


## 90 BREAKTHROUGHS & PIONEERS


**92 7 more facts about the history of medicine**
Caroline Rance offers some more intriguing examples of healthcare from the past

**98 Penicillin: when mould made medical history**
Dominic Sandbrook on Alexander Fleming's antibiotic advance

**101 Marie Curie: mother of radiotherapy**
Patricia Fara introduces the scientist who discovered radium

**104 Medicine's big bang**
Adrian Washbourne explores ten 19th-century innovations


### *Pioneers*

Meet four major innovators in epidemiology, germ theory, circulation and vaccination


**39 John Snow**
**61 Louis Pasteur**
**100 William Harvey**
**108 Edward Jenner**



**109 First World War: a medical milestone?**
Fiona Reid outlines major medical developments during the conflict

**114 Opinion**
The story of medicine is populated with both heroes and villains, says Gareth Williams

# History of medicine

**Caroline Rance** traces 12 millennia of developments in diagnosis, healthcare and surgery

A physician treats an eye complaint in a reconstructed fresco from an Egyptian tomb of the first half of the second millennium BC

A skull dating from c2200-2000 BC and excavated in Jericho, showing signs of multiple trepanning procedures

## c10,000 BC

Trepanning – **the procedure of drilling or scraping a hole in the cranium** to relieve pressure or treat other health problems – is widespread, seen in skulls found all over the world (see page 92).

## c1,800 BC

The first doctors whose names survive (and who included women – see page 54) work in Egypt. Medical papyri reveal that, though major surgery was not possible, **the ancient Egyptians were skilled at treating wounds and orthopaedic trauma.** The oldest such document, the Kahun papyrus, deals with gynaecological conditions.

10,000 BC — 2,000 BC

Beeswax was used to fill teeth in this jawbone c4,500 BC

## c7,000 BC

**Stone Age people use flint-headed tools to drill holes in molar teeth**, demonstrated by archaeological evidence found in Mehrgarh in Pakistan. In 2012, new evidence from a jawbone found in Slovenia revealed the use of beeswax as a filling around 6,500 years ago.

## c1,600 BC

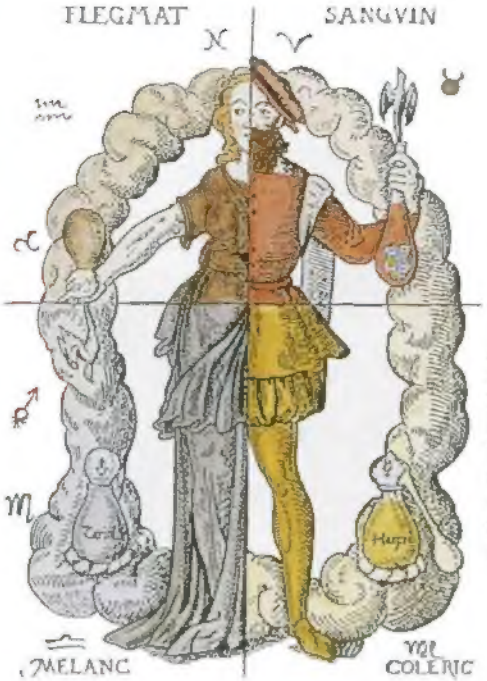
In Mesopotamia, each disease is thought to be the result of angering a specific god. Two types of medical practitioner – the *asu* and the *asipu* – use **a combination of botanical drugs, surgical procedures and incantations** to improve the physical and spiritual wellbeing of the patient, as described in cuneiform tablets comprising a treatise written 3,600 years ago.

## c1,000 BC

**An ancient Egyptian toe prosthesis**, acquired by the British Museum in 1881, is crafted from hardened linen. In 1998, another example was excavated in a tomb in Luxor. Researchers have established that the toes were not merely cosmetic but were designed to be functional.

A prosthetic big toe made from cartonnage – woven linen hardened with animal glue – dating from before c600 BC

GETTY/BERNADINI F, TUNIZ C, COPPA A, MANCINI L, DREOSSI D/BRITISH MUSEUM



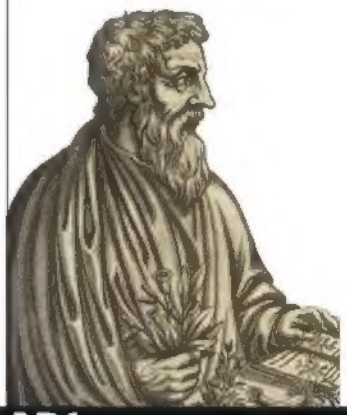

**A 1574 German illustration of the 'four humours' – a concept dating from the 5th century BC**

## 5th century BC

The concept of the 'four humours' forms a core tenet of Hippocratic medicine; it's an idea that will remain central to European medicine for over 2,000 years. It is believed that the humours – phlegm, blood, black bile and yellow bile – must be balanced for the body to remain healthy. **Medicine is focused on restoring equilibrium across the humours; bloodletting, for example, discharges excess blood.**

## 70 BC

The Greco-Roman physician **Pedanius Dioscorides** (pictured below) **categorises more than 800 medicinal substances** – mostly plants – in his five-book *De Materia Medica*, which details their therapeutic effects on the body and gives us an insight into the medicines in use in the Roman world. The book remains a principal medical text until the Renaissance.



**500 BC** **AD1**

**Hippocrates of Kos, the 'Father of Medicine', depicted in a 14th-century Byzantine miniature**

## c460 BC

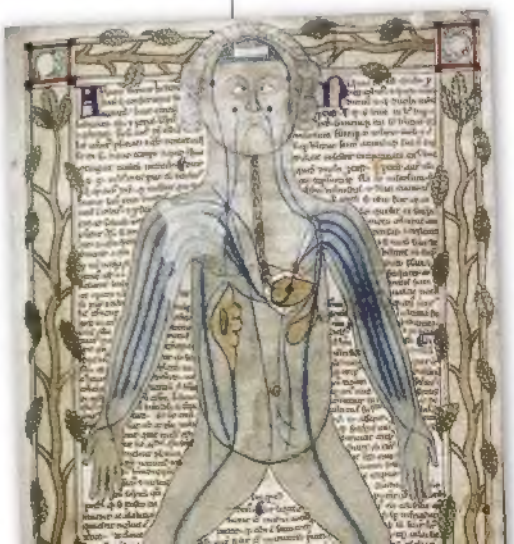
**Hippocrates – known as the 'Father of Medicine' – is born on the Greek island of Kos.** Details about his life are scanty. The works attributed to him, now referred to as 'the Hippocratic Corpus' and actually written by various authors, share a rejection of the idea that diseases were caused and cured by the gods, and emphasise the importance of lifestyle to health.

## c3rd century BC

*Huangdi Neijing* ('The Yellow Emperor's Classic of Medicine'), a Chinese medical book presented as conversations between a legendary emperor and his advisers, is written. It advocates following a simple life and **regulating the flow of the energy force called *qi*, reflecting the concepts of balance and harmony** common in Chinese medicine. The book is revised several times over the centuries until the Chinese Imperial Editorial Office issues a definitive version in the 11th century AD.

## c200 AD

Experiments on animals by Greek physician Galen of Pergamon become **the basis for European medicine's knowledge of human anatomy.** He expands on the precepts of the four humours, and writes prolifically – about three million of his words survive. Galen emphasises a spirit of inquiry and original thinking.



**A 1292 diagram of Galen's model of circulation. Galen believed that venous blood, generated in the liver, nourished the body**

GETTY/ALAMY

## c900

Persian physician Abu Bakr Muhammad ibn Zakariyya al-Razi (pictured above), director of hospitals in Ray and Baghdad, realises that Galen was not always correct about the progress of disease. Al-Razi describes the clear distinction between smallpox and measles, and notes that **people who survive such a disease will not contract it again.**

## 1213

Ibn al-Nafis is born near Damascus, where he studies medicine before moving to Egypt in 1236. He rejects Galen's teaching that blood crosses from one ventricle of the heart to the other through pores, and his critical commentary on Avicenna's *Canon* includes **the first description of pulmonary circulation.**

## 1309

**Lauretta of Piedmont obtains a licence to practise surgical techniques** including lithotomy – a frightening but survivable operation to remove bladder stones. She is among a small number of women – usually the daughters or wives of doctors – granted official licences to practise medicine in some Italian regions around this time.

**1000**

## 1025

Abu Ali al-Husayn ibn Abdallah ibn Sina (Avicenna) compiles all the medical knowledge of his time in his *Al-Qanun fi' al-'tibb* (*The Canon of Medicine*). The *Canon*, a detailed explanation of Galenic medicine, doesn't merely rehash Galen's ideas but presents them in the context of 11th-century knowledge, **drawing on Indian, Arabic and probably Chinese contributions to elucidate the ancient concepts.**

**An illuminated page from a 15th-century edition of Avicenna's *Canon of Medicine* – a comprehensive manual of medical knowledge in the 11th century**

## c1060

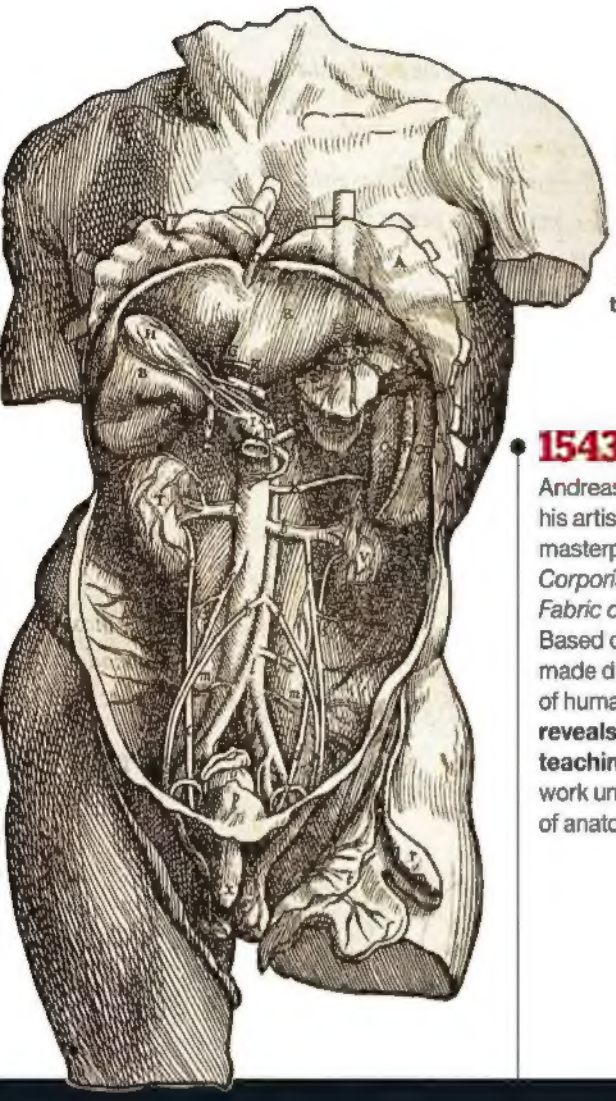
Constantine, a north African scholar visiting Italy, laments the lack of medical textbooks such as those of his homeland – the result of the separation of the lively intellectual milieu of medieval Islamic medicine from Europe by language and politics. **His efforts ignite a period of translation and study** that enables European universities to update their own scholarship.

## 1541

Theophrastus von Hohenheim (now remembered by the pseudonym Paracelsus, which he adopted late in life) dies, having challenged the idea of the four humours and **championed the use of mineral substances in medicine.** In response to criticism that his medicines are poisonous, he wrote about the importance of dosage in managing toxicity.

**A portrait of 16th-century physician Theophrastus von Hohenheim, known as Paracelsus**

BRIDGEMAN/GETTY



An engraving from Andreas Vesalius's masterpiece *De Humani Corporis Fabrica* showing in detail the anatomy of the abdominal cavity

Cinchona bark, from which the antimalarial quinine is derived

## 1543

Andreas Vesalius publishes his artistic and scientific masterpiece, *De Humani Corporis Fabrica* (*On the Fabric of the Human Body*). Based on observations made during the dissection of human cadavers, it **reveals errors in the teachings of Galen**, whose work underpinned the study of anatomy for centuries.

## 1546

**Girolamo Fracastoro proposes that disease is transmitted by invisible 'seeds'** on objects or in the air. It is clear that some diseases pass directly from one person to another, and Fracastoro's hypothesis provides an alternative to the ancient theory of miasmas – unhealthy vapours believed to rise from the ground and cause illness. Miasma and contagion theories co-exist until the late 19th century.

## 1631

Italian Jesuit Agostino Salumbrino sends to Rome a **sample of tree bark known by Peru's Quechua people to be effective against shivering**; it proves to work against the often-fatal disease malaria (now known to be caused by mosquito-borne *Plasmodium* parasites). In 1820 French chemists isolate the active ingredient, quinine.

**1600**

## 1545

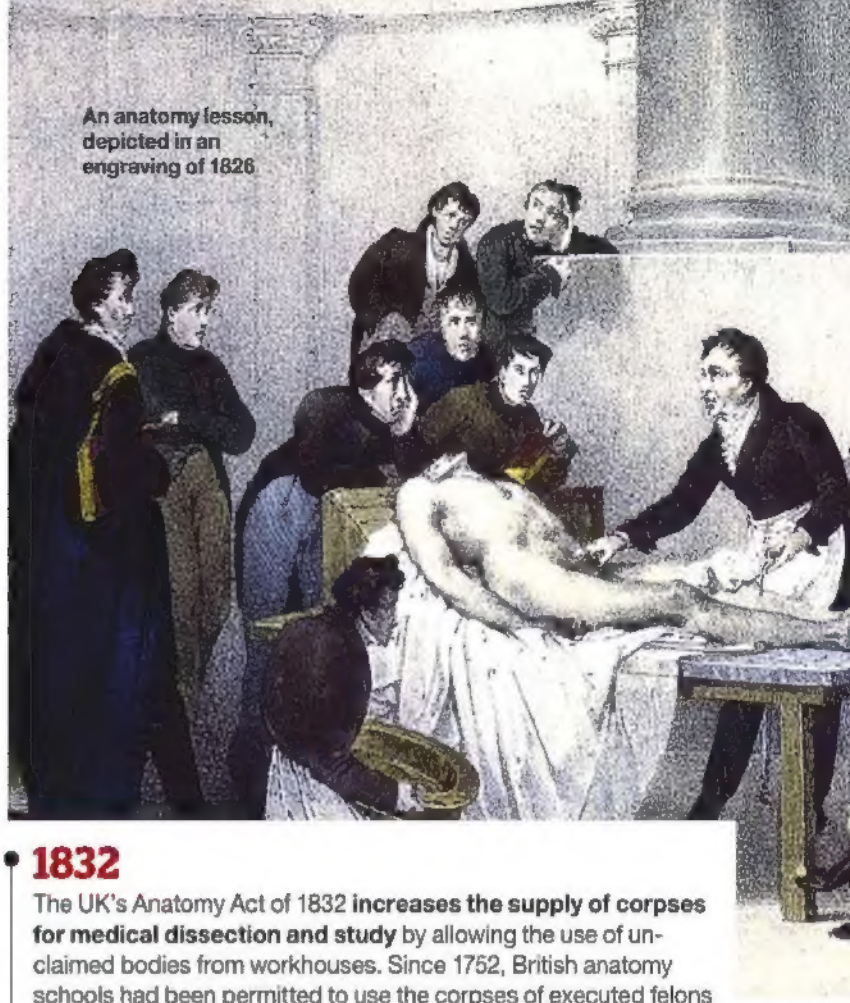
Ambroise Paré publishes his discovery, based on battlefield experience, that the agonising method of **cauterising gunshot wounds with boiling elder oil results in worse outcomes than treating them with a topical ointment**. Paré communicates this in a treatise in his native French, not the customary Latin, making it accessible to the average barber-surgeon.

Pioneering French battlefield doctor Ambroise Paré is pictured in action in a 19th-century lithograph

## 1628

**William Harvey demonstrates the systemic circulation of the blood** – the fruits of over a decade of scientific experiments. (For more on his work see page 100.)

GETTY/ALAMY/BRIDGEMAN



An anatomy lesson, depicted in an engraving of 1826

## 1665

An **epidemic of bubonic plague** decimates London's population.

A 17th-century plague doctor wears a beaked mask to protect him from 'miasmas'

## 1796

Edward Jenner scientifically tests the theory that **inoculation with cowpox also confers immunity to smallpox**, establishing the process of vaccination.

## 1832

The UK's Anatomy Act of 1832 **increases the supply of corpses for medical dissection and study** by allowing the use of unclaimed bodies from workhouses. Since 1752, British anatomy schools had been permitted to use the corpses of executed felons for teaching dissection. Yet there hadn't enough to go round, particularly after formal surgical qualifications became a requirement in the early 19th century, fuelling the lucrative bodysnatching trade.

**1800**

## 1721

**Inoculation** – the process of deliberately infecting someone with a mild dose of smallpox to prevent them getting the full-blown disease – **is introduced to England** by Lady Mary Wortley Montagu, who has observed the practice in the Ottoman empire. Around the same time, an enslaved man called Onesimus describes the African version of the procedure to a Bostonian in North America.

Lady Mary Wortley Montagu, who introduced variolation (smallpox inoculation) to England in 1721

## 1816

René-Théophile-Hyacinthe Laënnec uses a rolled-up quire of paper to amplify the sounds of a patient's chest, later developing his idea to devise **the first stethoscope**. Unlike later binaural stethoscopes, Laënnec's device is a 30cm-long, light wooden cylinder with a funnel-shaped central aperture down its length.

Illustrations of early stethoscopes and attachments from 1838

A Victorian stoppered bottle used for storing chloroform – employed as an anaesthetic in Britain from 1847

## 1845

The introduction of nitrous oxide as an **anaesthetic counters the pain and shock that previously hindered dentistry and surgery.** Ether is initially the preferred substance in the US; in Britain, James Young Simpson begins using chloroform in 1847. John Snow, also remembered for his work on cholera, pioneers the development of apparatus to safely administer anaesthesia.

ALAMY/WELLCOME IMAGES

## 1850s-1880s

The work of Louis Pasteur (above) and Robert Koch details **the role of bacteria in disease** – the culmination of a centuries-long process of discovery involving various thinkers and scientists. (Read about Pasteur's work on page 61.)

## 1895

**Wilhelm Röntgen discovers X-rays during his experiments with cathode ray tubes.** They quickly show diagnostic and therapeutic potential: as well as revealing broken bones and foreign bodies, they are used to treat a type of skin cancer. During the First World War, Marie Curie develops mobile X-ray units for use on the front line (see page 101).

An X-ray image taken by Wilhelm Röntgen of his wife's hand in 1895

# 1850

## 1849

Elizabeth Blackwell (pictured below) graduates from Geneva Medical College, New York, **paving the way for other women to study medicine in the US.** Women have always been involved in healthcare but (apart from a few anomalous cases) have till now been excluded from formal medical education. In Britain, women are denied access to full medical education until the 1870s

## 1865

**Joseph Lister pioneers antiseptic surgery,** reducing the risk of infection that has blighted operations till this time.

**A carbolic steam spray used by Joseph Lister to reduce infection during surgery in the late 1860s**

BRIDGEMAN/WELLCOME IMAGES

## 1928

Alexander Fleming finds that **a strain of the mould *Penicillium* inhibits the growth of his bacterial cultures.** The 'juice' secreted by the fungus is later developed into the antibiotic drug penicillin. (Read more about Fleming's crucial discovery on page 98.)

American soldiers organise blood bank containers during the Second World War

## 1940

Charles Drew establishes that **separating out plasma from donated blood prolongs the shelf life of the blood**, mitigating some of the storage problems encountered by blood banks in their infancy. Drew pioneers the large-scale collection and storage of blood for the allied war effort and the American Red Cross. Yet as an African-American he is at first excluded from donating blood, and campaigns for equality in the American Medical Association.

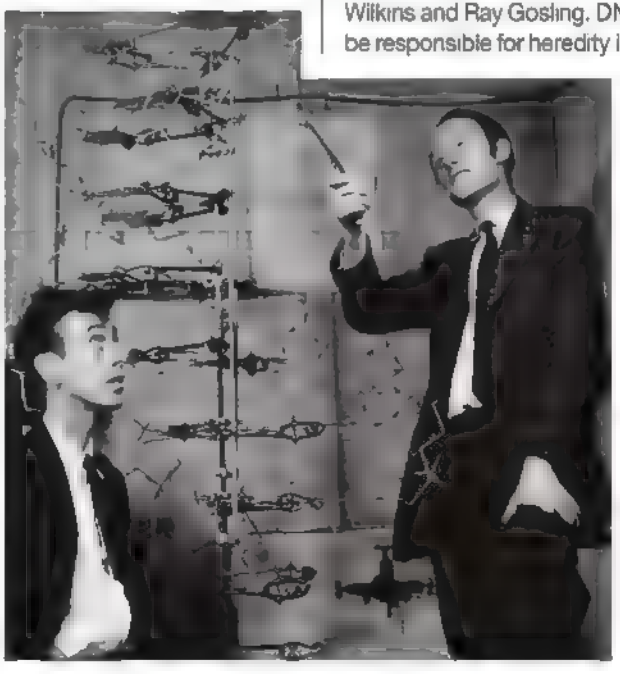
## 1950

## 1933

Ukrainian surgeon Yurii Voronoy carries out **the first human-to-human kidney transplant**, though the patient does not survive long after the operation. In 1953, Joseph Murray successfully transplants a kidney from one twin to another. The development of the immunosuppressive drug azathioprine by Gertrude Elion and George Hitchings in 1957 improves success rates. The first human-to-human heart transplant is carried out in 1967 by Christiaan Barnard.

## 1953

**James Watson and Francis Crick describe the double-helix structure of deoxyribonucleic acid** (DNA, originally called nuclein when first isolated by Friedrich Miescher in 1869), based on X-ray diffraction images produced by Rosalind Franklin, Maurice Wilkins and Ray Gosling. DNA had been shown to be responsible for heredity in 1944.



James Watson and Francis Crick with a model of part of a DNA molecule in 1953 – the year they established its double-helix structure

GETTY/SCIENCE PHOTO LIBRARY

Louise Brown, the world's first 'test tube baby', shortly after birth in July 1978

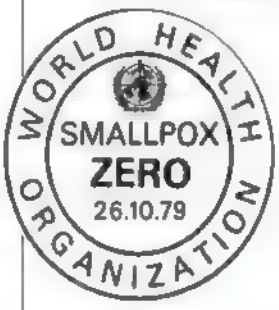
## 1978

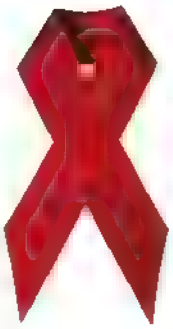
Louise Brown, **the world's first 'test tube baby', arrives on 25 July 1978**, having been conceived through in-vitro fertilisation, a procedure developed by Robert Edwards and Patrick Steptoe. More than five million IVF babies have since been born worldwide.

## 1979

The **World Health Organization declares the eradication of smallpox**. This success is the result of an Intensified Eradication Program launched in 1967 involving a coordinated system of vaccination, isolation and statistical surveillance, and contributions by millions of health workers of all nationalities, many of them volunteers.

A World Health Organization stamp marking the global eradication of smallpox



The red ribbon symbolising solidarity with people living with HIV and AIDS

## 1983

The **Human Immunodeficiency Virus that progresses to Acquired Immunodeficiency Syndrome (AIDS) is isolated.** Thirteen years later highly active antiretroviral therapy (HAART) is introduced, reducing the viral load to undetectable levels and hugely improving long-term survival rates.

## 1980

## 1953

Jonas Salk announces the **first successful vaccine against poliomyelitis**, a devastating disease that can cause lifelong disability. Six years later Albert Sabin introduces an oral vaccine, making wide distribution easier.

A girl awaits injection with the polio vaccine in 1957. The introduction of an oral vaccine four years later made administration much easier

GETTY/ALAMY/SCIENCE PHOTO LIBRARY


Antibiotic resistant bacteria are shown growing in the petri dish on the right. On the other dish, the bacteria will not grow around the antibiotics

## 2014

**The World Health Organization warns of a "post-antibiotic era,** in which common infections and minor injuries ... can once again kill". Antimicrobial resistance – resulting from the inappropriate use of drugs, rendering them increasingly ineffective against bacteria, viruses, fungal disease and parasitic microbes – is a real and increasing threat.

**Caroline Rance** is a writer who specialises in the history of medical advertising and health fraud. Her latest book is *The History of Medicine in 100 Facts* (Amberley Publishing, 2015)

# DEATH &

- **Health and healing in ancient Egypt**
  Diseases, diagnoses and treatments in the land of the pharaohs
- **Leprosy through the ages**
  How the disfiguring illness was viewed in centuries past
- **Snakes and ladders: wonder cures of the ancient world**
  Discover the universal antidotes and curious remedies of antiquity
- **Eye opener: The Stone of Madness**
  Discover a peculiar 15th-century explanation for mental illness
- **Marked by plague**
  Explore nine places around Britain affected by the Black Death
- **The Black Death: the historians' view**
  Four experts answer the big questions about the medieval pestilence
- **Pioneers: John Snow**
  The Victorian doctor who discovered how cholera is transmitted
- **Call the (Roman) midwife**
  Meet the women who managed childbirth in the Roman empire
- **Portraits of the plague**
  Poignant photos showing the impact of the third plague pandemic
- **The fatal flu that gripped the globe**
  Follow the course of the devastating worldwide Spanish flu outbreak

# DISEASE

ALAMY

A reconstruction of a stela from the 18th dynasty (c1539–1292 BC) depicts a priest with a withered leg – possibly the result of polio or a birth deformity

GETTY

# HEALTH AND HEALING IN ANCIENT EGYPT

The fertile plain alongside the river Nile was indeed a land of milk and honey – but also of parasites, workplace injuries and dental abscesses. **Carole Reeves** explores the diseases, diagnoses and treatments of ancient Egypt

Building sites can be dangerous places. And that's particularly true when the buildings in question are monumental tombs constructed without the benefit of modern equipment and safeguards – as in the settlement of Deir el-Medina, home to the workmen labouring on the tombs in the Valley of the Kings at Thebes (today's Luxor).

Deir el-Medina was occupied by about 600 artisans for 450 years during the New Kingdom, in the second half of the second millennium BC. Records of absenteeism note reasons including personal illness as well as caring for other sick workmen; scorpion stings were a common occurrence, and in one instance a workman had fought with his wife. But though that might paint a familiar picture, to understand the story of health and medicine in ancient Egypt we need to explore the belief systems and social and physical landscapes of the time.

> Records of absenteeism include personal illness; **scorpion stings were common**, and one workman had fought with his wife

Ancient Egyptian civilisation spanned some 3,000 years until it was toppled by Greek and Roman influences. Egypt's sharp transition between desert and the river Nile's fertile plain was instrumental in shaping the society and beliefs of the 2.5 million people who lived along the river's banks during the New Kingdom period (16th to 11th centuries BC). The majority were peasants, dependent for subsistence upon the Nile's annual flooding, which brought fertile silt to the land and was seen as a gift from the gods to

ensure the continuity of life. When the Nile rose too high, houses and fields were flooded, but when the inundation was inadequate there was famine and disease.

Life expectancy at birth was around 30 to 36 years (which was also the global life expectancy until about 1800), and rates of infant mortality were probably high. Dietary problems were evident. Mummies of elite individuals including priests and pharaohs, many of them young, often exhibit fatty arteries consistent with a diet high in saturated fats. Though most Egyptians ate a mainly vegetarian diet, the wealthy consumed beef, wildfowl such as duck and goose, cake, wine and beer. Salt intake was probably high because it was often used as a preservative. Skin folds of mummies including Ramesses III (reigned c1183–52 BC) show obesity, though these individuals were depicted as slim in their portraits. Gallstones have been found in several mummies.

Ideas about health, sickness and healing were pluralistic. Some temple complexes served as healing shrines and sanctuaries for the sick, and perhaps as training centres for priest doctors. Magico-religious rituals existed alongside treatments based on observation of the patient and knowledge of natural drug resources.

ABOVE **A wall relief at Karnak, near Luxor, depicting a fat man. Several pharaohs may have been obese, despite portraits showing them as being slender**
BELOW **The Edwin Smith Papyrus (c1975–1600 BC), which details 48 cases of injury**

Twelve 'medical papyri', dating from around 1850 BC to AD 250, have survived to be studied; between them these cite about 2,000 remedies comprising some 107 drug sources of plant origin, 28 minerals and 24 animal ingredients. Half of the drug sources used by Egyptian healers remain in use today, though many are now synthesised. Important raw materials used in prescriptions came from outside Egypt. Oil of fir from Syria and Asia Minor (now Turkish Anatolia) was used to purge worms and clean infected wounds. From eastern Africa came aloe, used to "expel catarrh from the nose", and cinnamon, an ingredient in an unguent for ulcerated gums.

## Scientific diagnosis

Of all the medical papyri discovered, the Edwin Smith Papyrus (c1975–1600 BC), detailing 48 cases of injury, is considered to be the most 'scientific' in its logical analysis of observation, symptoms, diagnosis and assessment of outcome with or without treatment. Such interventions included bandaging and wound suturing; indeed, splints made of tree bark have been found wrapped around healing bones.

Injuries and trauma would certainly have been common occurrences on building sites such as those near Deir el-Medina. Large workforces were needed for the construction of state buildings, particularly the pharaoh's mortuary complex. Indeed, a labour force of 84,000 employed for 80 days a year would have taken 20 years to build the Great Pyramid at Giza. On building projects, doctors were employed to oversee the health of workmen; a chief physician was appointed at Deir el-Medina.

Within bodies, the heart was believed to be the seat of an individual's thoughts and emotions, and its power could be felt under the doctor's fingers, as this description of the pulse from the Edwin Smith Papyrus makes clear:

"[As for] that [on] which any lay-priest of Sekhmet and physician puts his hands or fingers – [on the head, on the back of the] head, on the hands, on the pulse, on the legs – [he] measures the heart … [it speaks] to every vessel and every limb."

Diagnostic probing was done with the fingers, though a Roman-period carving on the Temple of Kom Ombo, near Aswan,

CAROL REEVES WELLCOME IMAGES/ALAMY

Half of the drug sources used by Egyptian healers **remain in use today,** though many are now synthesised

depicts medical instruments. These include cupping vessels, weighing scales, incense burners, probes, spatulas, scissors, lancets for cutting and cauteries for burning. The Ebers Papyrus (c1570 BC) mentions cutting and cauterising to stop bleeding or burn off skin lesions.

The Egyptians were afflicted by various illnesses. Arthritis and ankylosing spondylitis (arthritic fusion of the spinal vertebrae) have been found in mummies, as has spinal damage consistent with carrying heavy burdens. Evidence of tuberculosis has also been detected; figurines dating from before 3000 BC depict the spinal curvature characteristic of tuberculosis of the spine.

Blind singers and musicians feature in tomb paintings and wall carvings. These entertainers may have been blind from birth, but more likely they contracted one of the eye infections prevalent along the Nile, such as conjunctivitis and trachoma. The Ebers Papyrus contains prescriptions for eye ointments, many containing carob-pod pulp and honey. In modern studies, honey has been shown to have antibacterial and anti-fungal effects in the treatment of wounds, burns and ulcers; perhaps the ancient Egyptians observed its healing properties, though alternatively it may simply have been the most convenient binding agent for other ingredients.

The parasitic infection called schistosomiasis, still a serious public-health problem today, was present in Egypt over 5,000 years ago. Schistosomiasis damages many organs, particularly the liver and bladder, and causes internal bleeding. When Napoleon's troops invaded in 1798 and witnessed men passing bloody urine (haematuria), they branded Egypt the "land of menstruating men".

A typical sufferer was Nakht, a 14-year old weaver at a 20th dynasty Theban court (12th and early 11th centuries BC), whose mummy was examined in 1974 at the University of Toronto. Nakht was infested not only with the schistosome worm but also with other parasites including a tapeworm and *Trichinella spiralis*, ingested by eating under-cooked pork. Red blood cells in his bladder suggested that he suffered from haematuria while alive.

Nakht also had an enlarged spleen, which had bled before he died; recent research using DNA technology attributes such serious internal bleeding to malaria. One of the causative parasites of that disease, *Plasmodium falciparum*, has been identified in Egyptian mummies dating from 3500 to 500 BC, most spectacularly in Tutankhamun and many of his family members when they were DNA tested in 2009.

Regardless of rank, many Egyptians suffered severely from toothache. Tooth, gum and jaw disease were prevalent at all ages and were provoked by severe dental attrition (tooth wear) and abrasion. Poorly cleansed foods, the grinding of wheat and corn in stone vessels, and the contamination of cereals and flour with sand contributed to this wear and tear.

Periodontal (gum) disease was often so severe that teeth could be pulled out with the fingers, though they were not normally removed, because the cause of dental pain was considered to be a 'tooth worm' rather than the tooth itself. Teeth were so worn down that the dental pulp became exposed and infected, resulting in abscesses and cysts in the jaw. In skulls of the later Greek, Roman and Christian periods there was less attrition but far more caries (cavities) as the diet became more refined and an increased use of sugars became common. Many cavities resulted in abscesses. Such extensive dental infection must have undermined the health of many people.

If ancient Egypt mirrored other world civilisations, though, the major causes of ill health and premature death were infections and infectious diseases, including childhood infections.

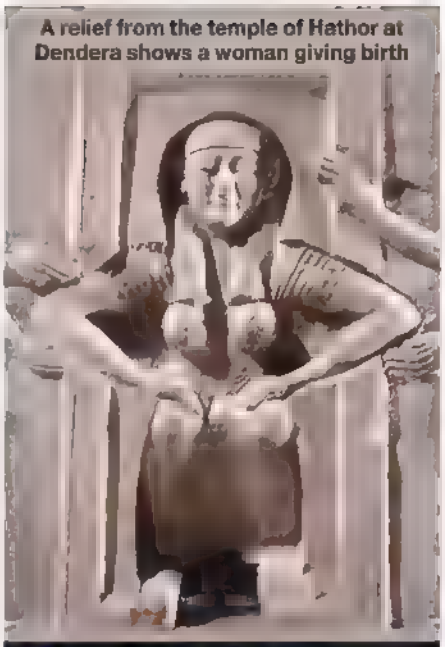
Although much of what we know about illness is based on studies of individual remains rather than population studies, the impact of biomedical science and reinterpretations of texts is expanding our knowledge of Egyptian medicine in new and exciting ways. Our diagnosis of the ancient world continues apace. ■

**Carole Reeves** is honorary senior lecturer in science and technology studies at University College London

DISCOVER MORE

**BOOK**

▶ **Egyptian Medicine** by Carole Reeves (Shire, 2001)



A relief from the temple of Hathor at Dendera shows a woman giving birth

## Gynaecology in antiquity

Women in ancient Egypt were, of course, afflicted with the same complaints that affect women today: period pains, fertility problems, miscarriage, labour pains, birth injuries and, if they lived long enough, the menopause. The Kahun Papyrus (c1850 BC) is devoted to diseases of women and pregnancy. It had been so heavily used that its ancient owner repaired it with a patch. Extracts from two of its case studies are revealing.

The first is an "Examination of a woman who is ill from her womb wandering..." The womb was not, it was believed, a static organ, but moved around the body wreaking havoc. This concept, first mentioned in the Kahun Papyrus, remained common in the west until the 18th century. The Greek word *hustera* (womb) gave us the term hysteria, a form of emotional instability stereotyped as feminine and believed to be the result of erratic movements of the womb.

The second extract suggests that "A woman waters in difficulty if the waters come... When she observes it, she will be the same for ever."

Injuries sustained during childbirth, such as tears and perforations, would have afflicted ancient Egyptian women, and this phrase is suggestive of a fistula or hole between the urethra (tube leading from the bladder) and the vagina. A woman's urine might thus be diverted entirely through the vagina or through both the vagina and urethra. A fistula might also leave her incontinent. "She will be the same for ever" suggests that this was considered an incurable complaint – as indeed it was until the 19th-century American physician James Marion Sims fashioned a metal vaginal speculum by which he visualised and stitched these holes.

GETTY

# LEPROSY THROUGH THE AGES

Disfigured outcasts, announcing their uncleanliness with a clanging bell, dominate historical images of leprosy – but as **Elma Brenner** explains, such depictions are both reductive and misleading

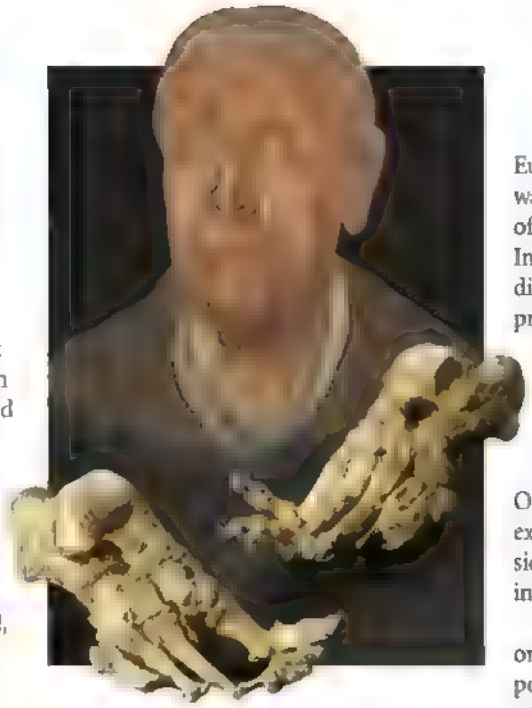
Among the diseases and afflictions encountered throughout history, leprosy is perhaps second only to plague in its associations with suffering, disfigurement and death. Images of sufferers cast out from society, forced to live in leprosy colonies and advertise their condition with a bell, have become clichéd portrayals of medieval leprosy – but they are far from the whole accurate picture.

The chronic illness known today as Hansen's disease is a bacterial infection that causes skin sores and ultimately, if untreated, damage to the bones of the face, hands and feet, as well as breathing difficulties and blindness. Unlike plague victims, sufferers can live with their symptoms for several years or even decades, so leprosy patients have constituted a recognisable component in past societies, probably present in Britain from the fourth century AD or earlier. Until very recently, there has been no effective treatment for leprosy; past therapies have been palliative rather than curative, including medicinal baths, bandaging and dietary regulation.

The history of leprosy and its sufferers is complex and sometimes ambiguous. The disease is mentioned in several passages of the Bible. It affected people in Europe in the Middle Ages, when numerous leprosy hospitals were founded, but declined across most of the continent from the 16th century, though it continues to occur in Africa, Asia and South America.

Colonial encounters with sufferers in other parts of the world in the 19th century caused Europeans to reflect upon the presence of leprosy in the medieval west, and to construct a narrative of a stigmatised, excluded group. This narrative has been questioned in recent decades; historians now emphasise the fact that leprosy patients were viewed as a special religious group, selected by God to suffer on earth and attain salvation, and were a major focus of Christian charity. Furthermore, although leprosy hospitals were located outside towns and cities, their residents remained connected with mainstream society, and received spiritual as well as bodily care – they were not shunned.

Our understanding of past views of leprosy is also complicated by ambiguity in the disease's identity in historical sources. From antiquity until 1873, when the bacterium *Mycobacterium leprae* was identified by GH Armauer Hansen, the word leprosy did not necessarily signify one single disease. Indeed, in the ancient Greek texts attributed to Hippocrates, *lepra* described



**The symptoms of leprosy include granulomas (above) and bone damage, as seen in these feet from a medieval Danish leprosy cemetery**

a range of different skin disorders. Similarly, in the Latin Vulgate Bible *lepra* was not clearly associated with a single medical condition. In fact, in the ancient world the disorder that most closely manifested the symptoms of Hansen's disease was called elephantiasis.

In the medieval and early modern periods, not all people who were diagnosed with leprosy suffered from Hansen's disease – other skin complaints, such as psoriasis, could be mistaken for the disease. Nonetheless, archaeological excavations of cemeteries associated with leprosy hospitals have confirmed that these institutions accommodated Hansen's disease sufferers: changes caused by the disease, ranging from bone lesions to the loss of fingers and toes, are clearly visible in skeletal remains. Recent scientific analysis of the DNA preserved in medieval bones has shed further light on the presence of Hansen's disease, and on the relationship between historical and modern strains of the infection.

By the 16th century, when markedly fewer incidences of leprosy were occurring in Europe, a finely tuned diagnostic procedure was in place; evidently, correct identification of the disease was considered important. Indeed, much was at stake: a positive diagnosis would affect an individual's professional and legal status, and would necessitate entry to a leprosy hospital. To make the diagnosis, physicians and surgeons examined the exterior of the patient's body and his or her blood and urine, and took a detailed case history. Other people who were considered to have expertise relating to leprosy, including the sick residents of leprosy hospitals, were also involved in diagnostic examinations.

Leprosy patients were viewed as a special religious group, **selected by God to suffer on earth and attain salvation**

At any point in time leprosy affected only a very small proportion of the population. It is not highly contagious, a fact recognised by many medieval and early modern people. A woodcut of a leprosy examination in a 16th-century surgical fieldbook shows a surgeon freely touching a suspected sufferer, placing his hands on the examinee's head. Yet the disease provoked fear and anxiety disproportionate to the threat that it actually posed. Many of these responses stemmed from the physical impairment and shocking disfigurement seen in advanced cases of leprosy.

In addition, leprosy became bound up with concerns about contagious illness in general – fears that increased dramatically following the Black Death of the mid-14th century and the arrival in Europe in the 1490s of the pox (syphilis). In many late medieval and early modern images, pox, plague and leprosy sufferers are depicted in much the same way, with their bodies covered in ulcers, suggesting that they were considered together as one large category of 'the sick'

Though attitudes to leprosy have varied through history and across locations, responses to leprosy have been characterised by both compassion and stigma. Today, effective treatment with antibiotics is widely available, but in India many sufferers still do not seek treatment until their symptoms are advanced, because of the associated stigma and shame. Historically, leprosy has stood out as a special illness, associated with divine grace, but has also become representative of sickness more broadly. Further historical study of the disease will help us understand the social impact of diseases in the past, present and future. ■

**Elma Brenner** is the Wellcome Library's subject specialist in medieval and early modern medicine

**DISCOVER MORE**

**BOOK**

▶ **Leprosy in Medieval England** by Carole Rawcliffe (Boydell Press, 2006)

# SNAKES & LADDERS

# WONDER CURES OF THE ANCIENT WORLD

Ancient Greece and Rome boasted many physicians and drug-sellers – who offered a wide range of solutions for healing people's ills. **Laurence Totelin** explores seven memorable remedies

A 5th-century BC Greek marble relief of a woman and child. Freckles on a pregnant woman indicated that she was carrying a girl, it was believed

## ◀ TAKING TESTS

### Ancient Greek tests and treatments for fertility involved garlic, freckles and tied-up testicles

Several helpful fertility and pregnancy tests are preserved in the gynaecological treatises of the *Hippocratic Corpus*, a series of texts written in the fifth and fourth centuries BC and inaccurately attributed to Hippocrates of Kos. It was stated in these texts that a tube in a woman's body connected the vagina with the mouth, and fertility tests were intended to determine whether the tube was blocked. For instance, a powerful-smelling ingredient such as garlic or oil of bitter almonds could be inserted into a woman's vagina; if the smell could be detected from her mouth, it had travelled up from her vagina, indicating that her tube was free from obstruction and that she would conceive without difficulty.

Once a woman had become pregnant, she could hope to determine the sex of her unborn child through various signs. If she maintained a good complexion during pregnancy, she was probably expecting a boy; freckles, on the other hand, were a sign that she was expecting a girl – at that time, a less-desirable outcome.

Fortunately, there were ways to influence a baby's sex before conception. Men who wanted to conceive a boy were encouraged to tie up their left testicle to ensure their seed came from the right testicle, which was considered the 'better' one, responsible for the production of male heirs.

BRIDGEMAN

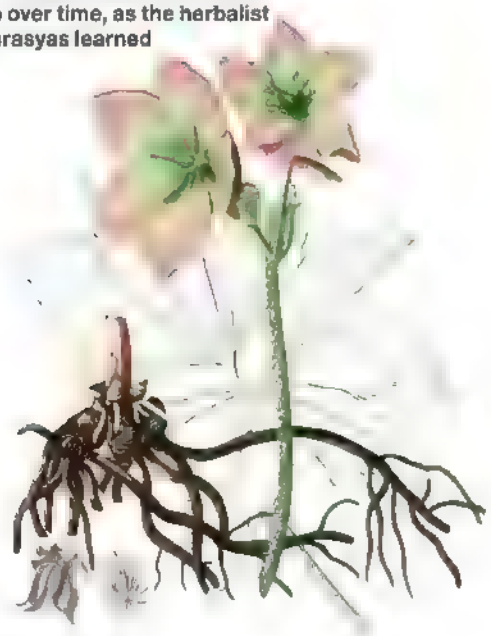
## ▼ SNAKE-OIL SALESMEN

'Experts' relied on the ignorance of others to peddle their 'antidotes' and 'cures' to the credulous

Though modern lab tests demonstrate that some ancient remedies were effective, others were completely ineffective or even dangerous. In a world without medical qualifications, anyone could present himself or herself as a drug expert, with their ability to sell drugs dependent not on true knowledge but, rather, their power of persuasion. Healers had to master the arts of showmanship and crowd-gathering to make a living out of their craft. Some crowd-gatherers simulated snakebites before applying a seemingly miraculous remedy. Others pretended that they had invented antidotes to protect them if they ingested poisonous plants.

Such remedy-sellers could, however, be caught out. Thrasyas, a well-known herbalist in Athens in the fourth century BC, built up resistance to the effects of hellebore, a very strong emetic and laxative, by ingesting small amounts daily – probably in order to sell some of his concoctions as alternative cures. His trick certainly attracted crowds, who watched in amazement as he safely ate small quantities of hellebore roots. But one day a passing shepherd ate an entire bundle of hellebore without suffering any adverse effects – showing that resistance could be achieved without buying Thrasyas's potions. According to Theophrastus, a famous Aristotelian philosopher, Thrasyas's reputation as an expert did not survive this episode.

**Hellebore, a poisonous plant – but resistance can be built up over time, as the herbalist Thrasyas learned**



BRIDGEMAN/GETTY

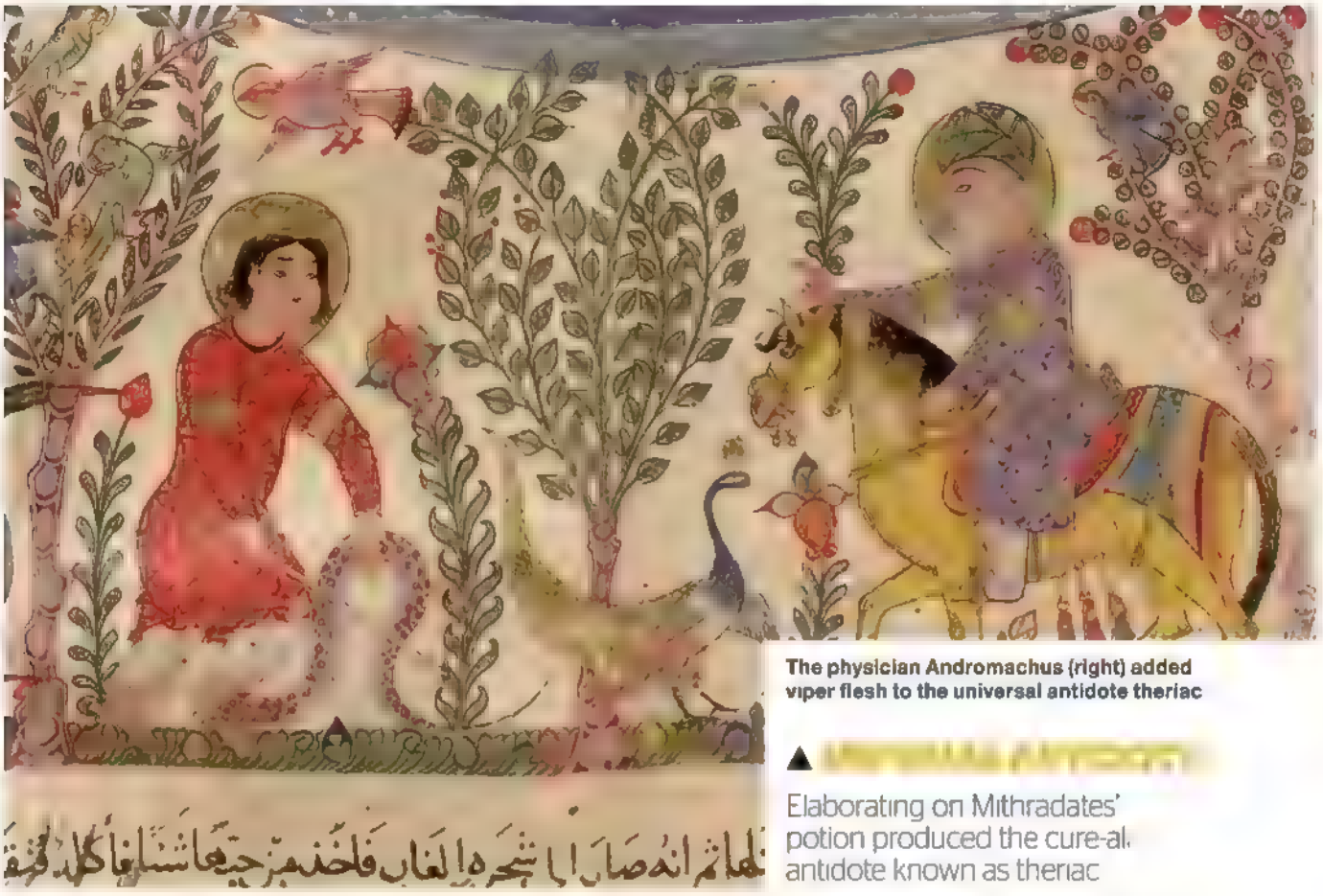
**A patient is suspended from a ladder in an illustration from a medieval manuscript. This procedure was used to treat spinal deformities**

## ▲ [illegible]

Common household objects such as the humble ladder could be incorporated into medical treatments

Another way to attract crowds was to perform spectacular treatments involving machinery. One such therapy was the 'Hippocratic ladder', used to treat people with spinal deformities. The treatise *On Joints* (written in the fifth or fourth century BC and again falsely attributed to Hippocrates) describes the procedure in detail: patients were attached to a ladder, sometimes upside down, then shaken or dropped from a height. In some cases, pulleys and wheels were used to hoist up the ladder. This 'treatment' was applied in front of a gathered audience, who apparently enjoyed the astonishing spectacle.

The author of *On Joints* called such 'physicians' charlatans – though it appears that he himself practised similar forms of orthopaedic medicine, albeit in a less showy manner. Because the humble ladder was a tool that most ancient families possessed, it could also be used in more 'homely' forms of treatment. Thus, in cases of difficult births, Hippocratic gynaecological treatises recommend attaching the expectant woman to a ladder and shaking her, thereby allegedly speeding up labour.



The physician Andromachus (right) added viper flesh to the universal antidote theriac

## ▲

### Elaborating on Mithradates' potion produced the cure-all antidote known as theriac

The exact recipe for the Mithradatic antidote provoked much debate among the Romans, and several versions circulated, most including numerous ingredients, many of which were exotic and expensive. The original recipe, however, might have been much simpler. The encyclopaedist Pliny the Elder states that it was composed of two dried nuts, two figs, 20 leaves of rue and a pinch of salt. Though Mithradates' antidote worked well against poisons, it was not so effective in treating the bites of venomous animals. In an attempt to solve that deficiency, Andromachus the Elder, physician to the emperor Nero (AD 37–68), added viper flesh to the preparation. He called his improved concoction theriac, and wrote its recipe in the form of a poem that was so obscure it required a prose translation.

This antidote reputedly offered protection against poisons, venoms and diseases including dangerous fevers. It required more than 50 ingredients and was therefore affordable only to the wealthiest people, though drug sellers did create cheaper alternatives. The emperor Marcus Aurelius (AD 121–180) allegedly took a daily dose of theriac, prepared for him by the famous physician Galen. Under the emperor there was such a fashion for the drug that some ingredients, such as cinnamon, became almost impossible to find in Rome.

## ▼

### The antidote created by an ancient king became renowned for many centuries

Mithradates VI (c135–63 BC), king of Pontus, a large kingdom centred on the Black Sea, had a rather strange hobby: he experimented with poisons and antidotes, testing them on condemned prisoners. A famous physician of the time, Zopyrus of Alexandria, sent him one of his own antidotes, which Mithradates tried on a poor convict who was forced to ingest poison then antidote – and, for good measure, also the other way around (antidote before poison). He miraculously survived – or so the story goes.

The king himself trained his body to become immune to poison by ingesting small quantities every day. This worked so well that, when Mithradates was defeated by the Romans and wished to end his life rather than die at the hands of his enemies, no amount of poison could kill him; he had to ask a friend to slay him with his sword. Pompey the Great, the Roman general who vanquished Mithradates, found notebooks written in the hand of the king, filled with information on dangerous plants and remedies against poisoning. He had those translated from Greek into Latin, and the Mithradatic antidote was sold for centuries.

An ornate jar produced in Italy in the 16th century for storing Mithradatic antidote

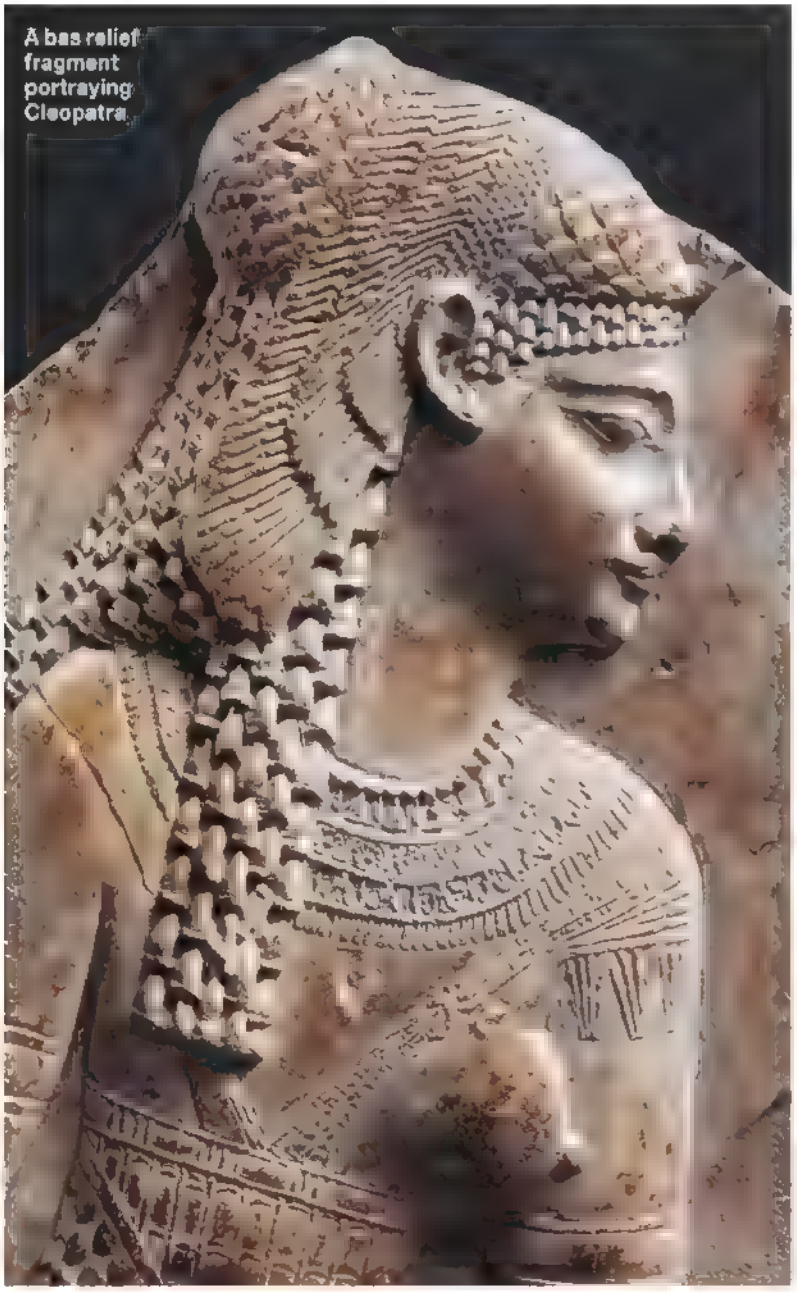
AKG IMAGES/ALAMY

## ▼ [redacted]

### The female pharaoh reputedly recommended various remed es including the use of mouse dung to treat hair loss

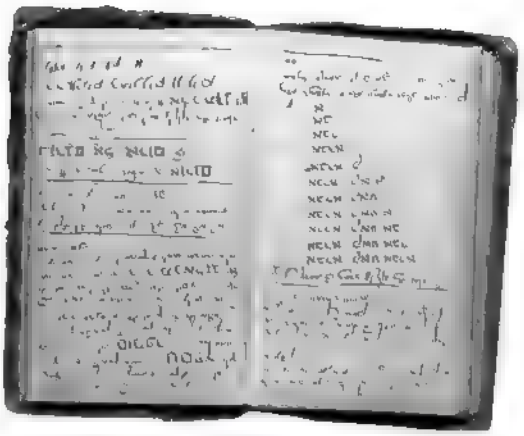
A generation or so after the death of the legendarily beautiful queen (c69–30 BC), a work on cosmetics started to circulate under the name 'Cleopatra'. The treatise is, unfortunately lost, but glimpses of it can be seen in the writings of later physicians. It appears to have included remedies for diseases that affect personal appearance (for instance, alopecia) alongside perfume and make-up recipes. Some of the recipes that have survived are rather unsavoury. To treat alopecia, Cleopatra recommended mouse dung, perhaps in the belief that the excrement would act as a fertiliser. Another recipe for hair growth included bear fat and cedar oil – a preparation so smelly that the user had to mix it with wine in order to blunt the stench.

The art of creating cosmetics seems to have extended to Cleopatra's namesake. A recipe to improve the complexion, attributed to Queen Cleopatra Berenice (c120–80 BC), is also preserved. Its main ingredient is powdered deer horn crushed in milk. Interestingly, 'hartshorn' remained a favourite ingredient in cosmetics until the 19th century.



A bas relief fragment portraying Cleopatra

BRIDGEMAN/WELLCOME IMAGES



**A Hebrew manuscript featuring a prescription for the amulet 'abracadabra' on the right-hand page**

## ▲ [redacted]

### The written word was useful in treating fever – even if it just made the patient feel a little happier

The magical word 'abracadabra' first appeared in a rather neg ected medical text: the Latin poetic *Medical Book* of Quintus Serenus Sammonicus, who wrote in the late second or early third century AD. We do not know whether Serenus was a physician or whether he took medical materia and presented it in a verse format to entertain his audience. The famous magical formula is to be found in a recipe aga nst a semi-tertian fever – that is, an intermittent fever that occurs every day, but more strongly every two days. Serenus recommends writing the word abracadabra on a piece of papyrus, repeating it on the next line without the last letter ('abracadabr'), and so on until only one letter ('a') remains. The result, text taking the form of a narrowing cone, should be tied with a linen thread to the patient's neck as an amulet.

Many ancient medical writings include examples of amulets, though authors had diverging views on their efficacy. The physician Soranus (first to second century AD) probably had the most enlightened opinion on the matter. He argued that amulets are not efficacious, but that their use should not be forbidden, because they can sometimes make the patient more cheerful. ■

**Laurence Totelin** is senior lecturer in ancient history at Cardiff University

DISCOVER MORE

▶ **Physicians, Plagues and Progress: The History of Western Medicine from Antiquity to Antibiotics** by Allan Chapman (Lion Hudson, 2016)

EYE OPENER

## THE STONE OF MADNESS

A surgeon performs a trepanning procedure on a patient afflicted with insanity in order to extract the 'stone of madness', as depicted in a painting of c1550 by the Flemish artist Jan Sanders van Hemessen.

In the Middle Ages mental illness was believed to be a spiritual complaint, caused by demonic possession. Yet in the 15th century charlatans claimed to be able to cure insanity by removing a 'stone of madness'.

# MARKED BY

Charlotte Hodgman talks to **Professor Mark Ormrod** about nine places connected with the Black Death, one of the most devastating scourges ever to afflict Britain

The Black Death, which swept across Europe during the 14th century, was responsible for the death of more than one third of Britain's population. Entering England in 1348, it had a devastating effect on the demographic and psychological shape of the British Isles.

It is generally accepted that the Black Death, referred to by contemporaries as the 'pestilence' or 'plague', arrived in Europe from central Asia in 1347. It spread rapidly across the continent from the Mediterranean ports, crossing the English Channel in the summer of the following year. Within months it had ravaged communities across the British Isles, transforming forever their social and economic fabric.

Historians still debate what made the disease such a devastating killer. Influenza, smallpox, typhus and even anthrax have all been suggested as possible culprits. However, the conventional theory is that the Black Death was a virulent outbreak of bubonic plague, most likely combined with a strain of pneumonic plague. Bubonic plague, a disease still present in some areas of the world, is now known to have been spread by fleas living on rats. It was identified by the appearance of black swellings ('buboes') in the armpit and groin, the size of which could vary from that of a small egg to an apple. Once buboes appeared on the body, the victim would probably have had around three days left to live. As few as three in ten sufferers are thought to have survived the disease.

> The plague terrified a population that lived in **constant fear of God's wrath** and the end of the world

The pneumonic plague was even more deadly: virtually everyone who contracted it succumbed in a matter of days. Unlike the bubonic form of the disease, the pneumonic variant was spread through direct contact with infected people.

Understandably, the arrival of the plague terrified a population that lived in constant fear of God's wrath and the end of the world. As entire communities were wiped out, the populace was thrown into

ALAMY

Bolton Castle in Yorkshire is an example of a substantial property built by the ruling classes to reassert their authority after the first plague outbreak in 1348

# PLAGUE

psychological crisis, viewing the plague as a mark of God's displeasure. On the continent, in particular, people made attempts to purge society of sin, and many undertook dramatic penitential acts such as self-flagellation. However, while some retreated to religion as their only hope against the disease, other groups adopted a more hedonistic attitude, taking advantage of the general disruption to make merry and enjoy their final days. Of great anxiety to all, though, was the suddenness of death, which left little time for a person to be absolved of sin and to guarantee their soul's safe delivery to heaven.

Spooked by a disease that steadfastly refused to distinguish between rich and poor, the upper classes – including King Edward III – retreated to the country, fleeing the unhygienic urban living conditions they believed to be the source of the malady. As dead bodies piled up in the streets of the cities vacated by the wealthy, some civic and church authorities attempted to dispose of the dead to minimise the risk of contagion. This led to the opening of plague pits in some urban areas.

Yet despite the shocking death toll and growing panic, there is evidence, says Mark Ormrod, co-editor of *The Black Death in England*, that medieval society was more resilient to natural disasters like the plague than would be the case today. "Famine and starvation were regular occurrences, as were diseases related to malnutrition," he says. "In fact, during the early 14th century the country had already suffered a famine that had reduced the population by between 10 and 15 per cent. Medieval society was arguably far more conditioned than us to the fact that natural disasters and diseases could have a profound impact on the population."

Yet there was one consequence of the Black Death that medieval England couldn't possibly be prepared for: its catastrophic impact on trade and the economy. With thousands dying and many more fleeing their lands, there was, in many areas, no one left to tend the land and grow crops. As a result, in 1348 and 1349 international trade plummeted.

This presented the wealthy with a nightmare scenario: fewer luxury goods, and fewer workers alive to produce them. Meanwhile, the poor who had survived the plague suddenly found themselves in a position of power: they could, and did, demand higher wages and better working conditions in return for their labour.

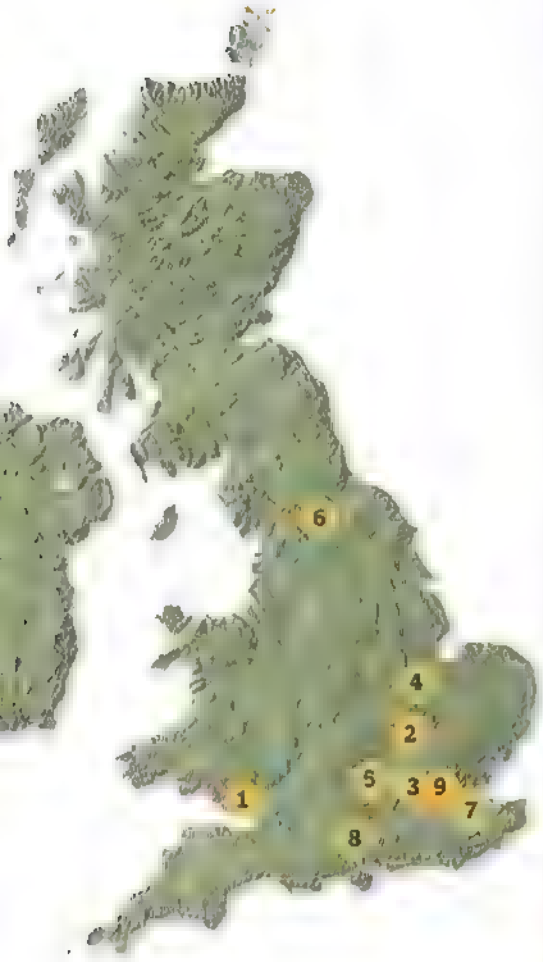
In response, during the summer of 1349 the ruling classes attempted to turn the clock back to the eve of the Black Death by making it illegal for employers to pay wages above the level offered in 1346. Harsh penalties were meted out to those who refused to work. Further legislation in the 1350s and 1360s reinforced this new form of social control. But the reaction to the Black Death also contributed to the Peasants' Revolt of 1381, as a later generation of workers became aware that they could command more for their labour and enjoy a better standard of living if only the economy were allowed to develop naturally.

One of the greatest tragedies of the Black Death was that, once it had arrived in the British Isles, it was here to stay, aided by climatic conditions. After lying dormant during the early 1350s following several wet summers and harsh winters, the disease reared its head once more in the early 1360s.

Although the death rate for this second outbreak was significantly lower than the first – mainly due to a degree of immunity in the generation that had lived through the first epidemic – a significant proportion of the population, which had tentatively blossomed in the 1350s, succumbed to the disease. The fact that contemporary chroniclers named this second outbreak the 'Children's Plague' gives an indication of whom it hit hardest. As a result, there was virtually no rise in the country's population for centuries after the Black Death – a fact that had enormous long-term consequences for an already struggling island.

**Mark Ormrod** is professor of history at the University of York and co-editor of *The Black Death in England, 1348–1500* (Paul Watkins, 1996)

▶ **Turn the page to discover nine places connected to the Black Death**




1 Cosmeston Medieval Village, Penarth, Vale of Glamorgan

2 St Mary's church, Ashwell, Hertfordshire

3 Charterhouse Square, London

4 St Pega's church, Peakirk, Cambridgeshire

5 St Mary's parish church, Ewelme, Oxfordshire

6 Bolton Castle, North Yorkshire

7 Rochester Castle, Kent

8 Winchester Cathedral, Hampshire

9 Great Hall, Palace of Westminster, London

# 1 Cosmeston Medieval Village

**PENARTH, VALE OF GLAMORGAN**

## Where a once-thriving settlement was abandoned

Located a few miles south of Cardiff, the long deserted medieval village of Cosmeston was rediscovered in the 1970s and has since been partially reconstructed and opened to the public. Little is known about the original settlement but the excavated buildings, dating back to the 14th century, were built around a manor house belonging originally to the de Costentin family and then, from 1316, the de Cavershams.

As with many deserted medieval villages, we do not know exactly why Cosmeston was abandoned. It appears that the village had started to decline by the end of the 14th century, and evidence indicates that by 1437 the manor had fallen into ruin.

As well as plague, many factors could have influenced the abandonment of Cosmeston, including the location of the village, which is low-lying and therefore subject to frequent flooding. What's more, Britain's population grew significantly throughout the 13th century, and it's possible that by 1300 the village had begun to outgrow the resources available to support it.

Cosmeston may also have fallen victim to the Great Famine that struck Europe between 1315 and 1317, and which increased the price of grain, resulting in starvation for thousands. Villages in medieval Britain were permanently 'calamity sensitive', making them particularly susceptible to natural catastrophes such as disease and famine.

Today, visitors to Cosmeston can experience life in what was once a real medieval village.

▶ *valeofglamorgan.gov.uk*


The once 'calamity sensitive' village of Cosmeston

ALAMY

# 2 St Mary's church, Ashwell HERTFORDSHIRE

## Where the fears of a village were carved in stone

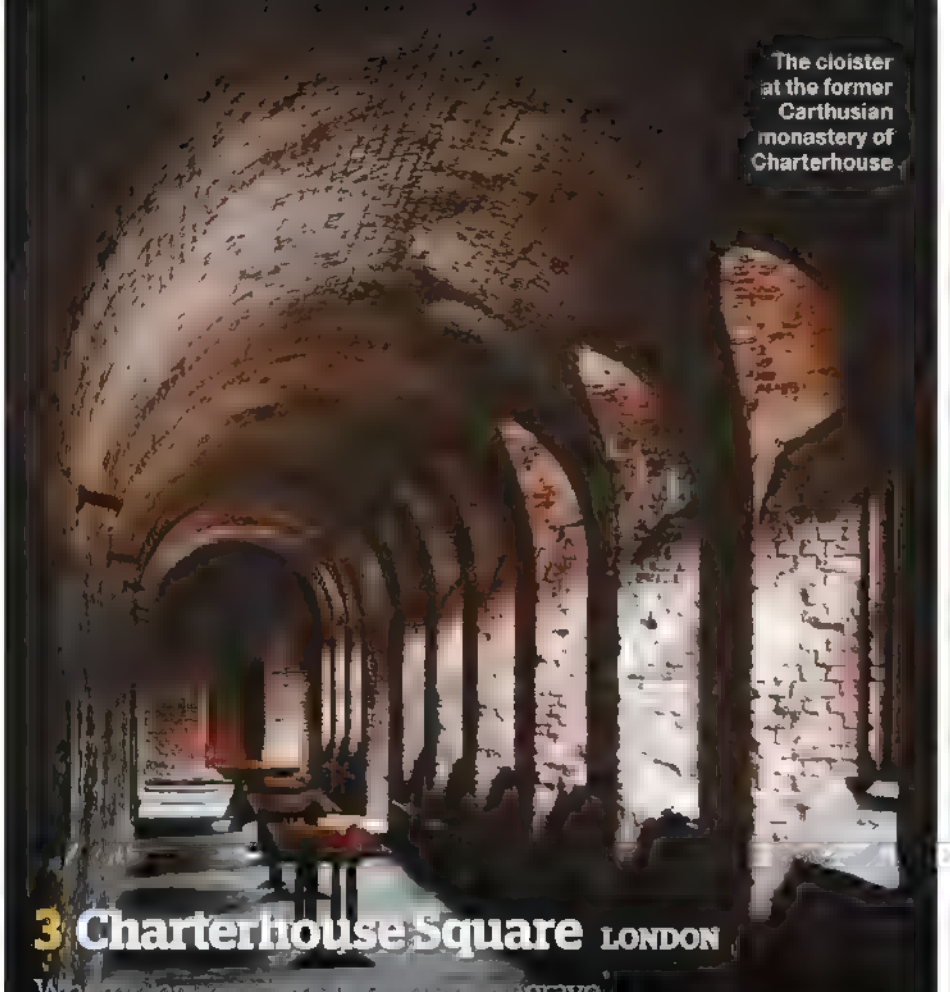
Despite surviving documentation, it is often hard to gain a sense of what it was really like to have lived through the Black Death. One of the most remarkable pieces of surviving documentation is the medieval graffiti scratched into the walls of St Mary's church, most likely by a member of the clergy, though nothing is known about its author.

The translated graffiti reads: *"There was a plague, 1000, three times 100, five times 10, a pitiable, fierce violent [plague departed]; a wretched populace survives to witness and in the end a mighty wind, Maurus, thunders in this year in the world, 1361."*

As well as mentioning the coming of the plague to the village in 1350, the writing also makes reference to another, later natural disaster: the 'St Maurus Wind', or 'Great Storm'. This violent storm wreaked havoc on the country, and contemporaries would have witnessed the destruction of many medieval structures, including church buildings – seen as yet more proof of God's divine wrath.

The medieval graffiti can still be seen on the north wall of the nave of St Mary's church.

▶ *stmarysashwell.org.uk/church/graffiti.htm*



The cloister at the former Carthusian monastery of Charterhouse

## 3 Charterhouse Square LONDON

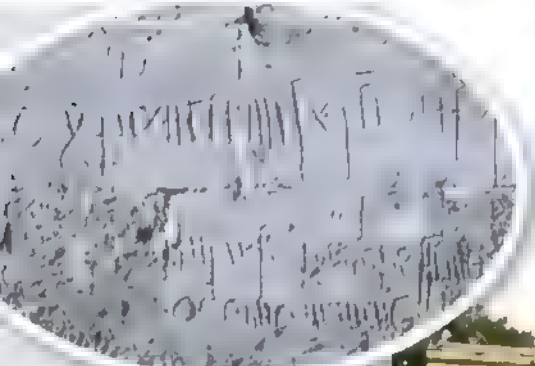
Where the living and the dead stand side by side

As the Black Death swept across the country, the numbers of dead rose too quickly for traditional funerary rites to be observed. At the height of the initial outbreak between 1348 and 1349, hundreds of people were succumbing to the disease every week in London. This forced parish authorities to find a practical and economical way of disposing of the bodies; for many parishes this took the form of mass graves known as plague pits. Plague bearers collected the dead at night to avoid the risk of further contamination, and the bodies were buried by morning.

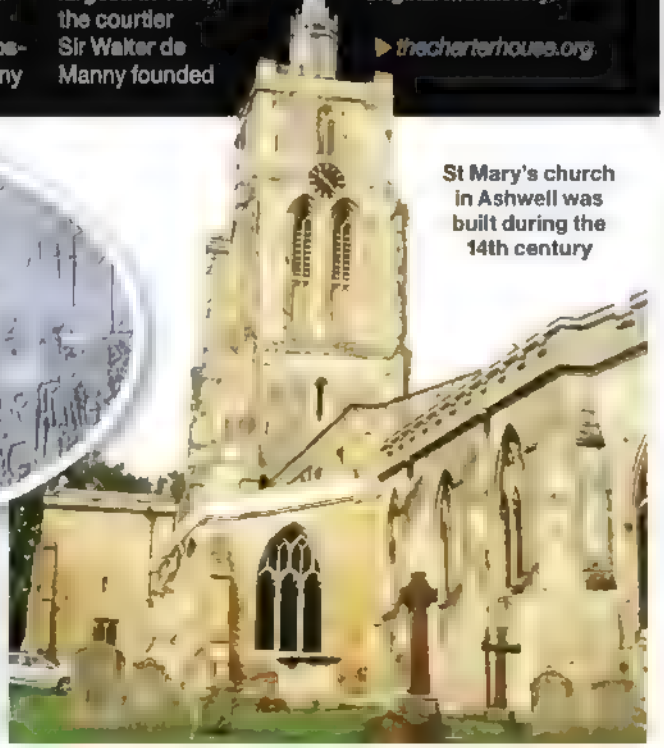
The plague pit at Charterhouse Square was one of London's largest. In 1371, the courtier Sir Walter de Manny founded a Carthusian monastery near the site to offer prayers for the souls of the victims of the disease. Such gestures were commonplace in the aftermath of the plague, as a penitent nation sought to reconnect itself with God. The remaining Tudor buildings stand on the site of the original monastery.

▶ thecharterhouse.org

DEAN AYRES/GILL THEAKER/ROBIN PEEL



ABOVE: An insight into the mind of someone who lived through the plague is carved onto the north wall of the nave



St Mary's church in Ashwell was built during the 14th century

## St Pega's church, PEAKIRK CAMBRIDGESHIRE

Where the living and the dead stand side by side

The Black Death, a disease that struck both rich and poor, had a profound cultural impact on the country. One example of a legend that became particularly significant was the story of 'the three living and the three dead'. The legend dated back to the 13th century, but artistic impressions of the story became especially popular with the generation born after the first plague outbreak in 1348. The legend tells of three kings who met three decaying corpses while hunting; the dead warned the kings that wealth, honour and power mean nothing after death, and urged them to repent.

In the wake of this horrific disease, survivors developed a fascination with the macabre, and sought to live a more virtuous, godly life. Paintings depicting the legend, such as the ones found at Peakirk, became common across the country and served as visual reminders that death waited just around the corner, regardless of wealth and status.

The wall paintings on the interior walls of St Pega's church portray the three kings, once decked in crowns and rich finery. Next to them stand three gruesome corpses, one still partially clothed in a burial shroud.

▶ peakirkvillage.co.uk

Three living, three dead, one painting

## 5 St Mary's parish church

**EWELME, OXFORDSHIRE**

Where the tomb of Chaucer's granddaughter lies

Alice Chaucer's tomb was designed to convey a clear message

As well as displaying a newfound piety through wall art, the people's grisly new fascination with death and decomposition also found expression on tombs constructed after the Black Death, conveying the message *memento mori* (remember that you will/must die). From the 1440s onwards, cadaver-tombs became popular among the upper classes, displaying the deceased as they had been in their worldly glory but also including an effigy of a decaying corpse, usually placed in an openwork tomb chest below.

Alice Chaucer, Duchess of Suffolk and granddaughter of the poet Geoffrey Chaucer, survived all three of her husbands; she died in 1475. Her tomb, in the church of St Mary the Virgin in Ewelme, is an excellent example of the new fashion for cadaver-tombs that emerged after the Black Death. Beneath a statue of Alice in all her finery – a widow and a pious woman – lies an effigy of her decaying body, designed to provoke contemplation of death among those viewing the tomb. The message to the living was clear: prepare your soul for a good death – while you still can.

▶ *ewelme.info*

Inside the Norman keep at Rochester Castle in Kent

## Bolton Castle NORTH YORKSHIRE

Where a stronghold was built as a statement of authority

In the aftermath of the first outbreak of plague in 1348, the working classes – reduced in numbers but in high demand – found themselves in a position of power, able to command higher wages and better working conditions. Anxious to restore the social order, the crown and upper classes introduced a series of laws that reverted the country's economy to the conditions that prevailed before the arrival of the Black Death.

The upper classes then sought to reassert their status through a spate of castle building, many of them taking over land that belonged to those who had died of the plague. These new castles offered security but importantly also represented outward displays of wealth, rank and power.

The construction of Bolton Castle was started by Sir Richard le Scrope, lord chancellor to King Richard II, in 1379 and was finally finished some 20 years later. The building is a fine example of a quadrangular castle enclosing a central quadrangle, with angle towers. It was described by Sir Francis Knollys as having "the highest walls of any house [he] had seen". The Scrope family themselves were one of the big success stories of aristocratic Yorkshire during the 14th century.

Bolton Castle can still be visited by the public.

▶ *boltoncastle.co.uk*

Bolton Castle offered both security and reassurance to the upper classes

## Rochester Castle KENT

Where peasants took matters into their own hands

Most historians agree that the Statute of Labourers of 1351, designed to freeze wages for the working classes at their pre-plague levels, contributed directly to the Peasants' Revolt of 1381. The Black Death had greatly reduced the numbers of labourers, and during the 1350s they had begun to demand better wages and shorter working hours. Unrest eventually turned into rebellion when a group of workers from Kent and Essex marched on London. The rebels captured Rochester Castle in Kent in June 1381, freeing the castle's prisoners. It was here that a peasant worker, Wat Tyler, was selected as a rebel leader.

After hearing of the rebellion, Richard II agreed to meet with the insurgents in an attempt to subdue the unrest, and subsequently agreed to their demands. In the meantime, however, a group of rebels had marched on the Tower of London and beheaded the archbishop of Canterbury and the king's treasurer.

It was during a second meeting with the king that Tyler was killed, some sources say that he was making drunken demands, or that he drew arms against the king. Ultimately, the rebels were dispersed and the king retracted all his promises

▶ *english-heritage.org.uk*

This illustration shows Wat Tyler attacking the poll tax collector

ALAMY ROBERT FROST/ROBERT HARDING/MARY EVANS

The magnificent – and austere – cathedral at Winchester, built in the (then) new perpendicular style

## 8 Winchester Cathedral HAMPSHIRE

### Where a new style of architecture was employed

As attitudes changed in the wake of the Black Death, so too did displays of wealth and status. During the early 14th century, English architecture was both intricate and labour-intensive, not to mention expensive. Known as the English decorated style, buildings were defined by their pointed arches, large windows and elegant spires. From the 1360s, however, English architecture became simpler, moving to the more perpendicular style seen in Winchester Cathedral, which saw work on its west gate begin in 1360. The flamboyant masonry of major buildings was replaced by straight lines, partly due to the new shift towards austerity, but also because of the depleted workforce available.

Many important figures from the period are buried in the nave of Winchester Cathedral, including William Edington, bishop of Winchester and the king's chief minister, who was a leading member of government through the first outbreak of the Black Death; he died in 1366. Also entombed here is William Wykeham, a 14th-century bishop, royal minister and patron of the arts and learning, who died in 1404.

Within sight of the west gate is a stone obelisk, erected in 1759 to commemorate the last occurrence of plague in Winchester – a serious outbreak in 1666 that claimed around 25 per cent of the population.

▶ *winchester-cathedral.org.uk*

SUPERSTOCK/ALAMY

## 9 Great Hall, Palace of Westminster

**LONDON**

### Where the country's recovery was displayed

By the end of the 14th century, the trend for straight lines and plain architecture had shifted again, and buildings now began to exude the feelings of confidence being felt across the country. A host of craftsmen were keen to make their mark, and the Great Hall at the Palace of Westminster is an example of how a new generation sought to celebrate life through architectural accomplishments.

Built in 1097, the Great (or Westminster) Hall is the oldest part of the palace. Further additions, begun by Henry III in 1245, were abandoned as plague struck the country. However, by the late 14th century the building had become one of Richard II's main architectural projects – a meeting place for royal government and a sumptuous display of the king's majesty. Life-sized statues of kings were placed in niches on the walls, and a huge hammer-beam roof, created by the royal carpenter Hugh Herland, replaced the original three Romanesque aisles with a single huge open space.

The Palace of Westminster forms part of the Houses of Parliament and is one of London's most popular tourist attractions. Tours of the building can be arranged via the website.

▶ *parliament.uk*

The Great Hall is the oldest section of the Palace of Westminster

# THE BLACK

## THE HISTORIANS' VIEW

Was it inevitable that plague would sweep Europe in the Middle Ages? How long did it take sufferers to die? And what was life like in its aftermath? Here, a panel of experts reflect on some of the big questions of a disease that repeatedly ravaged Europe over hundreds of years

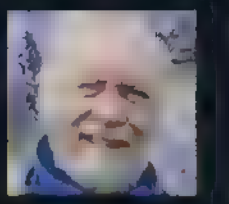
Words by Charlotte Hodgman

Two women do the 'dance of death' in a 15th-century woodcut. "The grim reaper of the plague stalked Europe for centuries, breaking out like earthquakes, unheralded and randomly," says Professor Tom James

# DEATH

## The panel

**Carole Rawcliffe** is professor emerita of history at the University of East Anglia. She co-edited *Society in an Age of Plague* (Boydell Press, 2013) with Linda Clark



**Tom James** is professor emeritus in archaeology and history at the University of Winchester. His books include *The Story of England* (Tempus, 2003)

**Mark Ormrod** is professor of history at the University of York. He co-edited *The Black Death in England, 1348–1500* (Paul Watkins Publishing, 1996) with Phillip Lindley

**Ole Jørgen Benedictow** is professor emeritus at the University of Oslo. He is author of *The Black Death 1346–1353: The Complete History* (Boydell Press, 2012)

People flee London during the Great Plague of 1665 in a contemporary illustration. In that year the disease killed 260 out of 350 residents of the Derbyshire village of Eyam

**Was an epidemic like the plague inevitable during the medieval period?**

**Ole Jørgen Benedictow**: No, it was not inevitable, but the requirements for its arrival and devastating long-term presence in Europe increased with rising population density and local and regional trade.

The development of long-distance trade by galleys and cogs from the late 1200s was crucial to plague's spread, because it linked Europe together and with distant trading stations and commercial hubs near plague focal points in north Africa, the near east, the Middle East and southern Russia. In the early 1300s, the probability that plague would arrive in Europe was rapidly increasing; the commercial and demographic requirements for its dissemination were all in place.

"Rising **population density and growing trade** made Europe vulnerable to the arrival of plague"

Ole Jørgen Benedictow

**Mark Ormrod**: Some people have a deterministic view of population history, believing that, in pre-industrial societies, population generally tended to grow at a faster rate than the economy, and that some external factor – be it famine, disease or war – would then intervene to re-establish the balance. There is plenty of evidence that parts of Europe were becoming 'calamity-sensitive' around 1300 and that the plague acted to restore equilibrium. But this is a long way from saying that the plague, in its form and timing, was a historical inevitability.

**Carole Rawcliffe**: Famine-related epidemics were a fact of life for people who lacked the benefits of modern medicine and whose levels of resistance were often compromised by poor diet and unhygienic living conditions, as well as by endemic diseases such as tuberculosis and malaria. Several serious outbreaks of infectious disease are recorded across Europe in the decades before the Black Death and, though none rivalled it in severity, there can be little doubt that conditions favoured the spread of a major pandemic.

**Do we know how many people actually died from the Black Death in the 14th century?**

**MO**: It is agonisingly difficult to get good population data for medieval Europe, even for England, where the information is especially rich. No one took death tolls, so we have to develop models of mortality from sources such as clergy lists, manor court rolls and tax records. The conventional view is that around a third of the population of Europe died in the first outbreak of the plague between 1347 and 1350. But the disease returned on a regular basis and became endemic for the following 300 years.

The second outbreak of the Black Death, in the early 1360s, became known as the children's plague because of the high mortality among the generation born since the first visitation. By the end of the 14th century the population of some parts of Europe may have been only half what it had stood at two generations earlier.

**CR**: Local studies prove instructive when ascertaining the death toll. In cities such as Norwich, for which we have a reasonably good idea of population levels before and after the first two national epidemics (about 25,000 in 1330 and around 8,000 in the early 1370s), mortality seems to have been sufficiently high to justify at least some of the claims made by contemporary chroniclers. Florence, which is better documented, lost about two-thirds of its

Franciscans treat plague victims in an Italian illustration from c1474. Religious guilds proliferated in the wake of the Black Death, offering care both to the afflicted and to lonely, destitute survivors

GETTY

> **"Panic, flight and the mass burial** of abandoned corpses were all common responses to the outbreak"
>
> Mark Ormrod

inhabitants in 1348 alone, but staged an effective demographic recovery. By contrast, many German cities escaped untouched.

**OJB:** My research indicates that very few mortality rates were as low as one third, and many were as high as 60 per cent or more. For example, studies of 7,655 householders in Provence reveal a mortality rate of 52 per cent; 79 studies of customary tenantry on manors across England show an average mortality rate of about 55 per cent. If we take into account the very high death rate among the poor, women and children, a general mortality rate of over 60 per cent is indicated.

### What would the disease have been like for those who contracted it?

**CR:** Even allowing for the exaggeration often found in medieval chronicles, first-hand descriptions of the Black Death make for grim reading. One account by a Franciscan friar from Sicily describes the initial appearance of small pustules or buboes, accompanied by a feeling of cold and stiffness, which would "so weaken and torment" the victim that he or she could no longer remain standing. Chill then gave way to a burning fever and searing pain as the buboes grew in size and the lungs became infected. By this stage the victim would be coughing up blood and vomiting incessantly until death intervened approximately four days after the first signs of infection.

### How were the afflicted treated by their families and communities?

**MO:** Responses were many and various, with panic, flight and the mass burial of abandoned corpses all common. One consequence was the growth of religious guilds, which aimed to provide some level of security for people worried they would have no kin to attend to them in illness or remember them after death.

**Tom James:** Some were abandoned. In Winchester in 1349, for example, townspeople attacked a monk conducting a burial service. The townspeople also took over parts of the burial ground around the cathedral priory so that plague burials could not take place there.

Evidence from London suggests that at first the dead were buried in coffins. As the disease got worse the bodies were placed in pits. However, the excavations show that the bodies were laid out in orderly rows, with respect. A pit in Hereford, by contrast, is suggestive that the bodies were thrown in more higgledy-piggledy. Elsewhere, contemporary evidence from Rochester relates that the pits were left open, and that weeping parents brought their children to the open pits and laid their bodies there.

**CR:** Levels of care varied dramatically from callous disregard to selfless devotion, although fear that the disease might be communicated through the gaze, breath or even the clothes of victims made most people understandably wary about close contact. In continental Europe (but not England), towns and cities engaged the services of surgeons and physicians whose duty was to care for the sick, but who sometimes took flight at the first sign of infection. In Italy, religious guilds undertook to provide support for the sick poor and the many destitute widows and orphans who were left behind after each epidemic.

### What was life like for the survivors of the Black Death?

**TJ:** Medieval people knew what to do in time of plague and other disasters. Disposal of bodies in pits is well attested from earlier disasters – for example a volcanic eruption in the tropics in 1258 that led to widespread famine in Europe. More than 10,500 skeletons dating to that disaster have been recovered from the Spitalfields market area of London alone since the 1990s – probably a proportion of a higher number.

There were set prayers and Bible extracts designated for use in time of plague. A special Mass of St Sebastian was used, for example Sebastian being one of the patron saints of plague, the arrow wounds of his martyrdom being a trope for the buboes of the plague that broke out on victims' bodies.

**MO:** The first outbreak of plague must have been an incredibly terrifying moment in human history. But medieval society was much more inured to natural and human disasters than is the case in the west today, and there is every sign that people re-established their lives remarkably quickly.

It was generally assumed that the plague was a result of poor air quality arising from high humidity or poor sanitary conditions. Although it took a long time to understand that the key cause of infection was the presence of rats, the idea of moving into the cleaner environment of the countryside did, in effect, provide some protection against infection for those lucky enough to escape the overcrowded towns.

**CR:** In England, the crown, parliament and local authorities did their best to contain such dangerous behaviour as the pollution of water supplies. Advice literature, increasingly produced in the vernacular rather than Latin, helped individuals and communities to avoid unnecessary risks. Spiritual health remained paramount, however, and although people may have grown less fatalistic in the face of disease they still regarded prayer and penance as their first line of defence.

### How did the epidemic change medieval society?

**MO:** If we take the long view, we can say that, for at least a proportion of the survivors of plague, there was a real improvement in the quality of life. By the 15th century we find that people who survived to maturity tended to live longer than earlier generations because they were better fed, clothed and housed.

The drop in the population resulted in a redistribution of wealth: workers could demand higher wages, and tenant farmers could demand lower rents. This gave the poor more expendable income.

**CR:** Such a dramatic and sustained fall in population levels brought distinct benefits for ordinary people. On the whole, English men and women ate more meat and dairy produce than before and, in a rental market that favoured tenants rather than landlords, they were able to afford better quality housing.

The sanitary reforms introduced by urban authorities also made towns and cities cleaner and more pleasant places to live – or at least aimed to do so.

### What was the Black Death's impact on European history?

**OJB:** The Black Death and subsequent plague epidemics resulted in a temporary halt in the development of the early Renaissance, which was not resumed until about 1450. It oriented the mental focus and energy of the time towards death and salvation – *ars moriendi*, the way of achieving a good death, became of paramount importance. This found expression in the movement towards the Reformation, which broke down the authority of the Catholic church as a guarantor of salvation, and conferred to the individual the decisive task of achieving salvation through a pious and righteous life.

**TJ:** There's no doubt that the Black Death was devastating when it first struck Europe between 1347 and the early 1350s. However, the impact of the plague was exacerbated because it returned in 1361, 1374, 1389 and then in 1665 with the Great Plague of London and elsewhere. At Eyam in Derbyshire, for example, it is reckoned that 260 out of a population of 350 died when they cut themselves off from the outside world in 1665.

"In Rochester **weeping parents brought their children** to open pits and laid their bodies there"

**Tom James**

ABOVE: **These lead crosses, found during the excavation of a London cemetery, may have lain with victims of the Black Death**

Plague continued in France until around 1720 – prompting Daniel Defoe's fake *Journal of the Plague Year* (1722). In that sense, the grim reaper of the plague stalked Europe for centuries, breaking out like earthquakes, unheralded and randomly.

**MO:** The Black Death had a very different impact on western and eastern Europe – largely due to the response of the respective elites. In the west, the scarcity of population and the resulting increase in the economic capacity of the peasants meant that feudal lords were unable to enforce their traditional rights and had to engage in an open labour market. As a result, serfdom – the idea that peasant families were tied to the manor and had to perform unpaid service to their lord – simply became irrelevant.

In eastern Europe, conversely, the elites responded by reinforcing serfdom. The divergence was to be evident for centuries to come and had huge consequences for the levels of commercialisation and industrialisation experienced across Europe between the 16th and the 19th centuries.

### What do you think about research suggesting that gerbils, not rats, spread the disease?

**OJB:** The theory that the Black Death and subsequent plague epidemics arose among gerbils in east Asia according to climatic cycles should not be taken seriously. It is based on a series of erroneous or false historical assertions – as are many other plague theories, such as those that suggest it was carried by human fleas and/or lice, or that it was, in fact, a viral disease that spread much like influenza.

**MO:** The gerbil theory is a fascinating idea but at the moment it is just a hypothesis. It's worth noting that the scientists involved are assuming the Black Death was indeed bubonic plague borne by fleas living on the backs of rodents; the only difference here is that the rodents may have been gerbils rather than rats.

Other researchers in the past have suggested that the disease could have been anything from influenza to anthrax. All of this is a reminder of the many uncertainties that remain around the nature and spread of the Black Death pandemic.

**DISCOVER MORE**

**LISTEN AGAIN**

▶ To listen to **Melvyn Bragg** and guests discussing the **effect of the Black Death on Europe** for *In Our Time*, go to *bbc.co.uk/programmes/b00bcqt8*

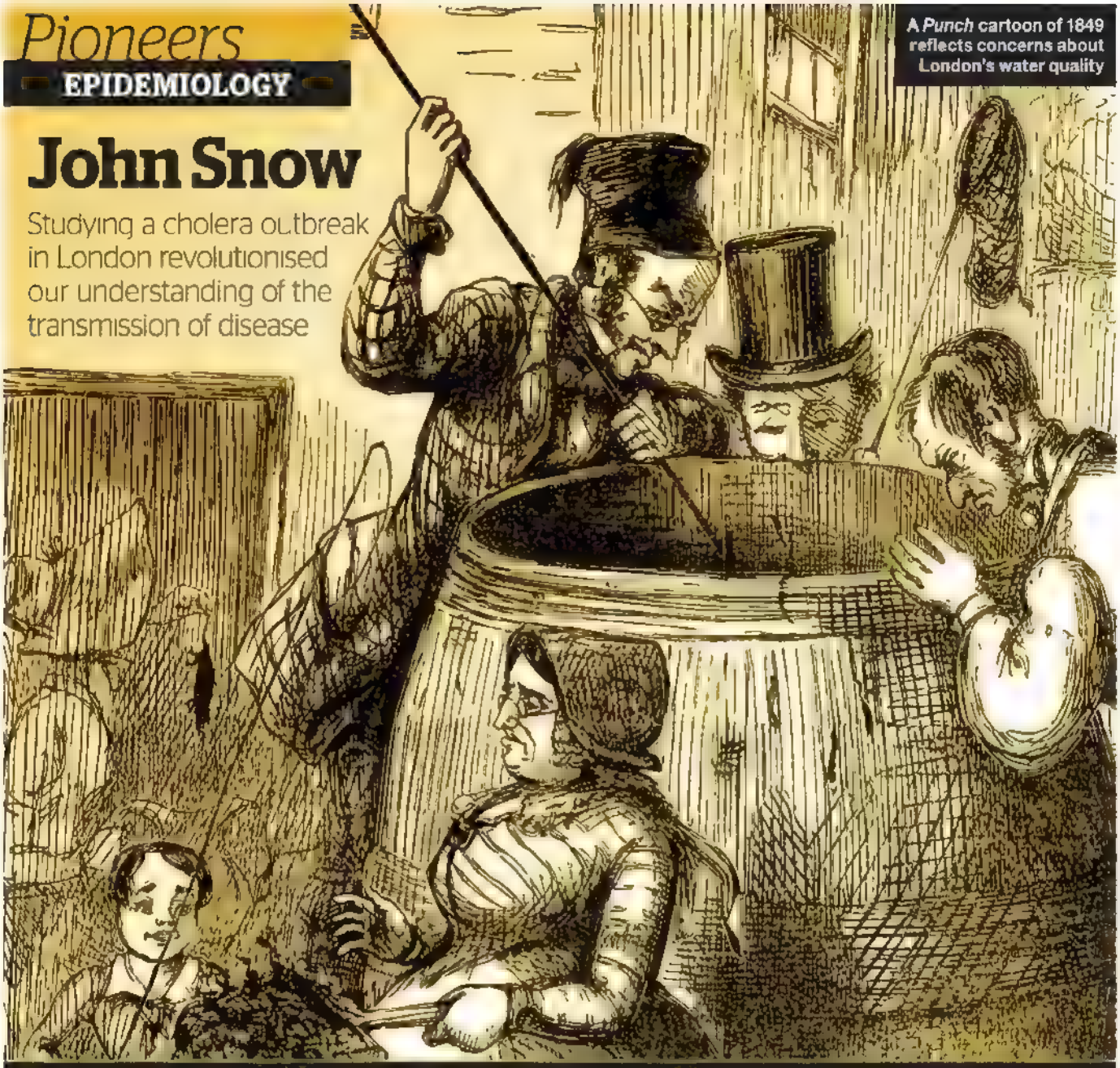
WELLCOME IMAGES

*Pioneers*

**EPIDEMIOLOGY**

# John Snow

Studying a cholera outbreak in London revolutionised our understanding of the transmission of disease



A *Punch* cartoon of 1849 reflects concerns about London's water quality

GETTY

Until recent decades, John Snow (1813–58) was best known as the doctor who administered chloroform to Queen Victoria during childbirth. But Snow's real crowning achievement was his investigation into a cholera outbreak in Soho in 1854.

Asiatic cholera, which arrived in Britain from India via Europe in 1831, baffled the medical profession. It particularly affected poor, overcrowded areas, so the middle classes dismissed it as a symptom of 'moral degeneracy'; medics attributed such diseases to 'miasmas', or bad air.

Snow, a labourer's son from York, first encountered cholera during his apprenticeship to a Newcastle surgeon; he then completed his studies in London, where he set up in practice. An eager researcher, he contributed to medical journals, designed surgical instruments and became an early pioneer of anaesthetics. He was also interested in hygiene and the spread of disease, becoming a founding member of the Epidemiological Society of London in 1850.

Studying the 1854 Soho outbreak, Snow noticed that cases clustered around a water pump on Broad Street (now Broadwick Street), which he identified as the source of the outbreak. He told residents to boil their drinking water, and the pump handle was removed.

> Snow told residents to boil their drinking water, and the pump handle was removed. **The epidemic ebbed**

Snow was unable to isolate a particular factor from the water, and he did not yet fully understand cholera, but he (and other researchers) began to grasp that it was carried in infected water. Snow undertook a study of around 300,000 people, showing that those consuming water from the local area (contaminated with sewage) were much more likely to contract the disease than users of clean water piped in from further away.

This use of data and social science tools was a milestone in the history of epidemiology. It also added to pressure for clean water and effective sewerage systems. Thanks to men such as Snow, Britain's cities became much safer places – and began to smell better, too. EI

*Words: Eugene Byrne*

An ancient Roman relief shows a midwife delivering a baby. Many midwives had other occupations and undertook the task as a contribution to their community

WELLCOME IMAGES

# CALL THE (ROMAN) MIDWIFE

Even today, childbirth can be arduous, even dangerous – so how did mothers deal with the challenges in antiquity? **Laurence Totelin** introduces the midwives of the Roman empire and explores their techniques

A second century AD bas-relief on the tomb of Roman midwife Scribonia Attica depicts her at work

Marcus Ulpius Amerimnus and Scribonia Attica, a husband and wife who lived in the second century AD, rest together in their funeral monument at Ostia, near Rome. According to an inscription on the walls of the tomb, Scribonia herself commissioned it for the eternal rest of her family and freed-people. Marcus was a surgeon, as we learn from a bas-relief on the tomb, where he is represented in the act of treating a leg wound, next to his – rather oversized – surgical instruments.

Scribonia was a midwife, as illustrated by her own bas-relief, where she is shown delivering a child (pictured above). A naked woman sits in a birthing chair (a special seat with handles for the mother to grip during contractions), her belly swollen. She is supported by a woman, perhaps a relative, while the midwife sits on a low stool in front of them, ready to catch the baby; she looks straight out at us rather than at her patient's genitals, perhaps to spare her blushes.

Scribonia, as another of her names, Attica, indicates, had Greek origins, as did her mother Scribonia Callityche; their ancestors probably included slaves. But the midwife Scribonia had gone up in the world: she had made a good marriage with a skilled healer, and she had acquired wealth. Like her husband, she had tools, which she brought to women in labour: the birthing chair and the stool on which she sat were hers.

Childbirth in the Roman empire, as everywhere in the ancient world, was women's business. Female midwives and family members brought children into the world and attended to the care of newborns. However, with the exception of inscriptions or art on funeral monuments such as that of Scribonia, almost no first-person accounts of pregnancy and childbirth in ancient Rome are available; our knowledge is mediated instead through the writings of male authors.

> The ideal midwife should be "literate, with her wits about her, possessed of a good memory ... **with long, slim fingers and short nails**"

Admittedly, some of these men were very well informed, sympathetic to women, and prepared to recognise the skill of midwives. Soranus of Ephesus in Asia Minor (in what's now Turkey), who was a physician active at the turn of the first and second centuries AD, was such an author. An adherent of the Methodic school of medicine, he favoured gentle treatments over harsh ones – and nowhere is this more apparent than in his *Gynaecology*, the only one of his treatises to be preserved in full.

The volume opens with a description of the ideal midwife: she should be "literate, with her wits about her, possessed of a good memory, loving work, respectable and generally not unduly handicapped as regards her senses, sound of limb, robust and, according to some people, endowed with long, slim fingers and short nails at her fingertips".

All this advice, down to the shortness of the nails, is very sensible but smacks of wishful thinking. Certainly, not all midwives in the ancient world were literate. Literacy was not an essential accomplishment for a trade that was often passed from one female relative to another in an apprenticeship based on the oral word. Some tricks of the trade, such as contraceptive or abortive remedies and preparations to speed up a difficult birth, were best kept secret – and therefore not written down.

## Part-time birthers

As for respectability, that was a matter of perspective. The author Eunapius, writing in the fourth century AD, reports an anecdote in which a hostess in a Roman wine shop – described as a relatively upmarket one – was serving a client when she was called by a neighbour and kinswoman to attend to a difficult birth (she was also skilled in midwifery). After the safe delivery of the child, she washed her hands and promptly returned to her customers. In many cases, midwifery was an occupation on the side – something undertaken by women as a contribution to their community's welfare. Those who, like Scribonia, specialised in the business of birth and took the title *obstetrix* (midwife) may have been the exception rather than the rule.

It is tempting to assume that birth in the ancient world was a much more dangerous affair than it is today: there was little pain relief available, and little knowledge of

GETTY

infection and basic hygiene. However, in cases of uncomplicated births, women in the Roman empire could manage well with the assistance of only a wise family member – without much intervention apart from massaging of the genitals with an emollient such as warm olive oil. Advice on breathing could also help: Soranus tells us that women should "press their breath" when the pains are most acute.

Women may also have found some comfort in wearing amulets to speed up the birth. Many amulets in the ancient world were made from perishable materials, but examples from Roman Egypt (30 BC–AD 641) made from durable haematite stone have been discovered. One example, now at the Kelsey Museum in Michigan, was inscribed with magical formulas and a representation of the uterus that could be opened and closed with a key – closed when the woman wanted to avoid pregnancy or wanted to 'lock' her uterus after conception, and opened when she wanted to become pregnant or to open up her uterus for labour.

Things became more complicated when labour was lengthy and a baby awkwardly positioned. Midwives and doctors relied on their most trustworthy instruments – their hands, with which they could gently encourage the opening of the uterus or attempt to reposition a baby whose presentation was poor.

Ancient texts do not mention episiotomies (cutting of the perineum to facilitate the birth of a child), nor are there references to forceps, and no such instruments have been found in the archaeological record. Though the 'caesarean section' allegedly derives its name from that of Caesar, Roman midwives and doctors did not undertake the procedure. Stories of ancient C-sections are all mythical – for example, the story of how baby Aesculapius, the god of medicine, was snatched from the womb of his dying mother, Coronis, by his father Apollo.

## Treatments and traumas

Midwives and doctors might administer herbs that caused the uterus to contract when the labour slowed down. Accounts tell of women being tied to ladders and shaken in order to speed up labour, although Soranus vehemently decried the practice. In the worst situations the mother's life took precedence, and an embryotomy was carried out: the embryo was cut into pieces and extracted from the womb using hooks. Another risk for women in labour was retention of the placenta, which could lead to haemorrhage. Latin medical texts preserve various recipes for remedies that allegedly facilitated the expulsion of the afterbirth.

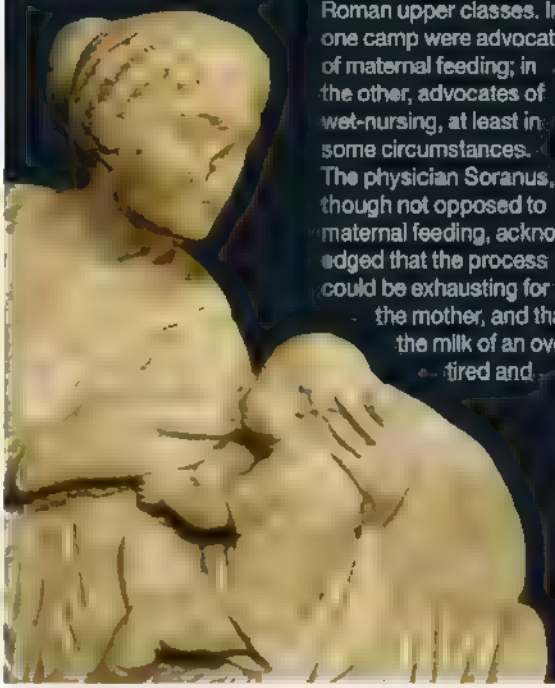
# Whose breast is best?

## The question of whether mothers should breastfeed their own babies was a thorny one in ancient Rome

In antiquity, the only safe way to feed a newborn baby was breastfeeding. Finding animal milk (usually goat's milk) in a big city such as Rome was not always easy, and the milk could prove indigestible or even dangerous. The vast majority of babies in antiquity were breastfed, often for what we would consider to be long periods of time – over 18 months. Ancient baby bottles have been discovered, but they were probably designed for feeding toddlers rather than very small babies.

Debates over baby feeding raged among the Roman upper classes. In one camp were advocates of maternal feeding; in the other, advocates of wet-nursing, at least in some circumstances. The physician Soranus, though not opposed to maternal feeding, acknowledged that the process could be exhausting for the mother, and that the milk of an overtired and feverish mother could prove harmful for the baby. A good wet-nurse – Greek, well-tempered and below the age of 40 – would be ideal. However, that perfect nurse may not always have been available, and other authors also worried about the bad influence that a wet-nurse could exert on her charge, because the Romans believed that character was passed through breast milk.

More generally, the Romans considered breast milk to be a powerful substance that could treat ailments ranging from phthisis (a respiratory illness) to cases of poisoning and eye complaints. Ancient recipes for eye remedies often recommended that ingredients be diluted in human milk – an ingredient that was readily available, and certainly cheap.



A relief from a second-century AD sarcophagus portrays breastfeeding

Ancient authors were aware that childbirth could be an ordeal for women, and could leave them exhausted or even kill them. Pregnancy, too, could cause discomfort, strange cravings – for coals and earth, for example – and nausea, against which the first-century-AD natural philosopher Pliny the Elder recommended the pips of citron (a citrus fruit).

One source recounting a case of ancient morning sickness – or, rather, its most severe form, hyperemesis gravidarum – is found in the *Miracles of St Stephen*, a fourth-century Christian text falsely attributed to St Augustine. It tells the story of a woman named Megetia who was afflicted with such bad vomiting in pregnancy that she dislocated her jaw, which made her unable to properly take food. After physicians proved unable to treat her, she travelled to the sanctuary of St Stephen near Carthage where, upon being visited by a snake in a dream, she was healed by the power of her faith in the Christian god.

Early Christian texts in general offer interesting insights into pregnancy and childbirth, because they are more focussed on the experience of women than any preserved medical text. According to the *Protoevangelium of St James*, an apocryphal gospel dating to the second century AD, Joseph called upon midwives after Jesus was born in a cave (not a stable, as tradition usually has it). One of these midwives, Salome, refused to believe that a virgin had given birth, and asked to inspect Mary's genitals to check for the normal vaginal distention and blood loss that accompany birth. She found none of those signs – but her hand caught fire, healing only after she repented of her doubts. Though the story is, of course, a miraculous one, it does demonstrate that ancient midwives were used to dealing with the normal blood, sweat and tears of childbirth.

**Laurence Totelin** is senior lecturer in ancient history at Cardiff University

DISCOVER MORE

**BOOK**

▶ **Soranus' Gynaecology** translated by Owsei Temkin (The Johns Hopkins University Press, 1956, reprinted 1991)

# PORTRAITS OF THE PLAGUE

Words by Charlotte Hodgman

Between 1855 and 1959 – more than 500 years after the medieval Black Death – a new plague pandemic ravaged the globe, killing some 12 million people. Images collected in an innovative project vividly depict the outbreaks

**Death watch**

Shenyang, China, 1911

Plague struck north-east China between 1910 and 1911, killing 60,000; the fatality rate among those infected was 100 per cent. These men at the gates of Shenyang's plague hospital have covered their faces with white cloth, and the hospital wall has been whitewashed, probably with a lime solution used as a disinfectant. Improvements in public health reduced casualties in a 1920 outbreak by four-fifths.

KITASATO MEMORIAL MUSEUM/THE KITASATO INSTITUTE

## Conflicts in care

Hong Kong, summer 1894

The arrival of plague in Hong Kong in 1894 saw British colonial authorities and Chinese elites clash over anti-plague measures and treatment of the afflicted. The issue of where to hospitalise patients was a particular bone of contention – as this image, showing patients lying in a makeshift facility at the Kennedy Town Glassworks factory, demonstrates. The open windows reflected a British practice – Chinese doctors considered drafts to be lethal.

**IN CONTEXT**

## The Third Plague Pandemic

The Third Plague Pandemic (1855–1959) was unprecedented for a number of reasons. For the first time in history bubonic plague reached all five continents, striking major cities from Hong Kong (in 1894) to Bombay (1896), Sydney (1900), Cape Town (1901) and Los Angeles (1924). The pandemic left an estimated 12 million dead (including 10 million on the Indian subcontinent), and saw the implementation of extraordinary measures for its containment.

The previous two plague pandemics (in 541–42 and 1346–53) had left society baffled as to their origins. Yet by the late 19th century scientists had a far greater understanding of plague – in fact, in Hong Kong in 1894 they were able to isolate the bacillus that causes it. By 1905, scientists had also acknowledged the role of the rat and the flea in plague transmission. Yet these discoveries did little to improve public health measures.

Quarantine, forced evacuations and the torching of neighbourhoods, such as Honolulu's Chinatown (1900), were all employed against the pandemic, causing distress and conflict across afflicted areas.

As the first epidemic of any infectious disease to be photographed as it travelled across the globe, the pandemic left an extraordinary legacy of visual material. These images reveal the enormous and diverse impact of the plague on communities – from attempted regulation, through de-roofing of houses and forced segregation, to efforts to control the ways in which people dealt with the dead.

## Fire fight

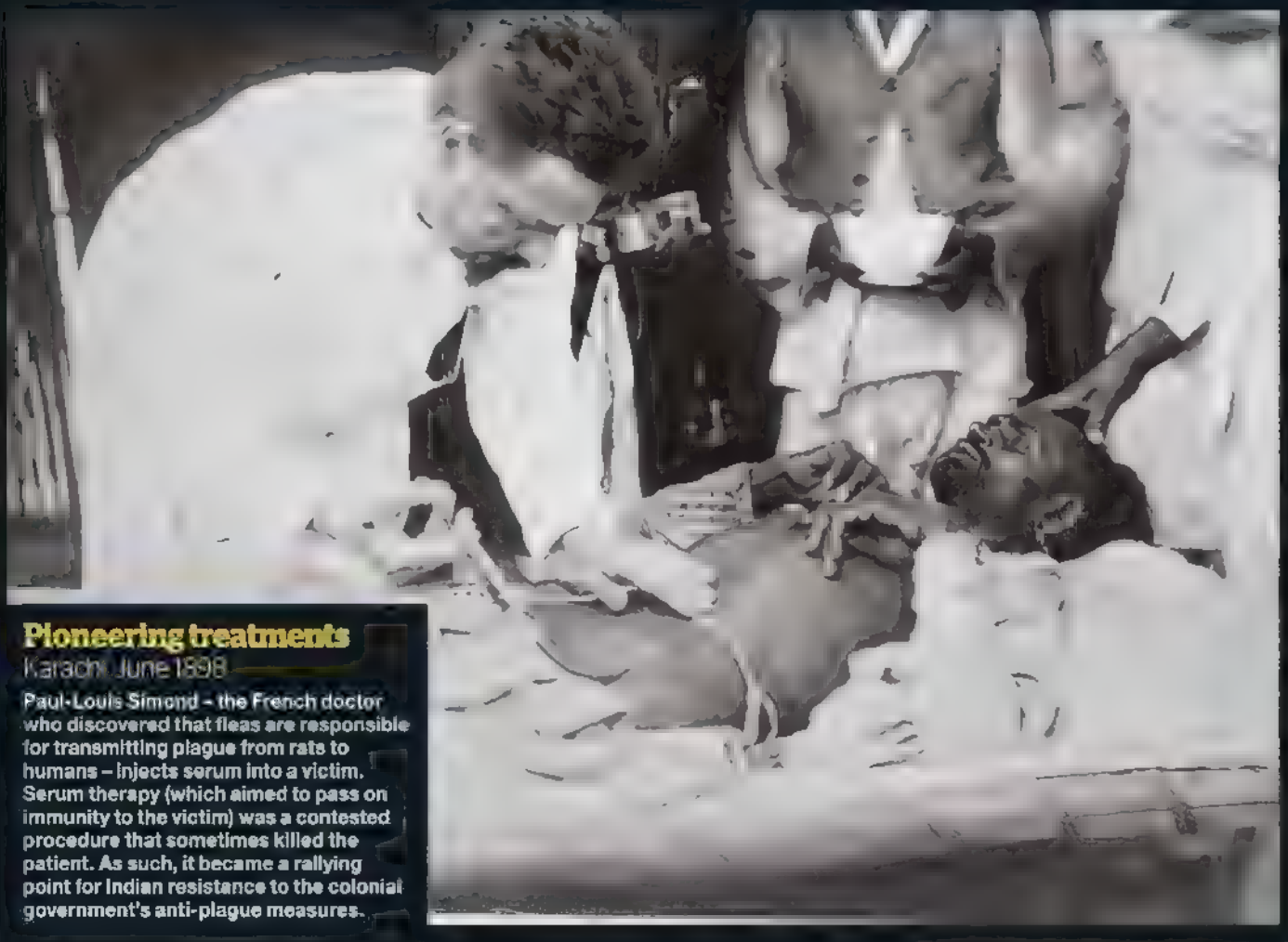
Honolulu, 1899-1900

Plague arrived in Honolulu in December 1899. In response, the authorities closed down the harbour and Chinatown. They also burned houses in Chinatown that were deemed to be insanitary, as shown here. On 20 January 1900, the burning of plague-infected buildings in this area of the city got out of control and an area of some 65 acres (26 hectares) went up in flames.

## Last rites

Bombay (now Mumbai), 1897

Hindu and Muslim funerary rites in India captured the imaginations of colonial photographers. Images such as this, of a Hindu burning ground at Sonapur, littered the pages of the British press, relaying news of the disease back to a Victorian audience fascinated by what was, to them, the exotic social world in which plague was thriving.



## Pioneering treatments

Karachi, June 1898

Paul-Louis Simond – the French doctor who discovered that fleas are responsible for transmitting plague from rats to humans – injects serum into a victim. Serum therapy (which aimed to pass on immunity to the victim) was a contested procedure that sometimes killed the patient. As such, it became a rallying point for Indian resistance to the colonial government's anti-plague measures.

WELLCOME LIBRARY/LONDON/HAWAII STATE ARCHIVES

WELLCOME LIBRARY, LONDON/HONG KONG UNIVERSITY LIBRARY

## Doused in petrol

Liverpool, c1900-20

In a bid to prevent the spread of the disease, men of the Liverpool Port Sanitary Authority dip rats into buckets of petrol to kill the fleas. Though there was no widespread outbreak of plague in Britain, deaths were recorded in Cardiff, Glasgow and Suffolk. Cases were also reported in Liverpool, most notably in 1901, 1908, 1914 and 1916.

## Brush with death

Harbin, China, 1921

Protective measures were crucial in restricting the spread of plague. Here, a man in overalls, full face mask, goggles and gloves washes his boots during the 1920–21 epidemic in Harbin that caused 3,000 deaths. H

### DISCOVER MORE

**ONLINE**

▶ The images in this feature were collated by the ERC-funded project Visual Representations of the Third Plague Pandemic, at CRASSH, University of Cambridge, led by Dr Christos Lynteris. For more details on their work, follow them on Twitter at @visualplague or go to *crassh.cam.ac.uk/programmes/visual-representations-of-the-third-plague-pandemic*

# THE FATAL FLU THAT GRIPPED THE GLOBE

In the final few months of the First World War, a new horror swept around the globe – a disease that eventually afflicted up to one-third of humanity. **Laura Spinney** traces the course and consequences of the great Spanish flu pandemic

GETTY

soldiers in 191
the Spanish flu epide
Despite its comm
name, the first cases o
the disease were
recorded in the US

A church in California is thronged by people praying for protection against the epidemic. Despite attempts to limit mass gatherings, such measures were not effectively applied

Between 1918 and 1919, influenza swept around the world in a pandemic that would soon come to be known as the 'Spanish flu'. It's been estimated that one in three people on Earth – 500 million – fell ill, and between 50 and 100 million of them died. It was the greatest tidal wave of extermination since the Black Death of the 14th century, yet it's often treated as a mere footnote to the First World War, which killed fewer than 20 million people. But as more information comes to light about the disaster, its true contours are revealing themselves.

Though the origins of the Spanish flu remain a mystery, one thing seems certain: it didn't start in Spain. By the time the first cases were recorded in that country, in May 1918, the disease had already been spreading in the US for a couple of months, and in France for weeks or longer. Unlike France and the US, however, Spain was neutral in the war, so didn't censor its press. Hence when the Spanish king Alfonso XIII and several members of his government fell ill that spring, the world read all about it – and their affliction was soon labelled "the Spanish disease". This misconception was encouraged by the belligerent nations that knew they'd contracted it before Spain in order to shield their own populations from potentially morale-lowering news. The name stuck.

The disease first appeared in the British Isles by June 1918, having probably been introduced by returning military personnel or refugees from the continent. This was the first wave of the pandemic and, though relatively mild, it spread quickly through a civilian population that had had no prior exposure to the strain in question, and whose defences were low after four years of wartime shortages, upheaval and stress. When it returned that autumn in a second wave, there was no longer anything mild about it. By that time the disease was more lethal in its own right, and also more likely to be complicated by pneumonia. It diffused through Britain from south to north, albeit more slowly than the first wave, and receded in early January 1919. The third and final wave, which was intermediate in virulence between the other two, arrived in February of that year and departed in April.

## No ordinary flu

The Spanish flu started like any ordinary flu – with a sore throat, headache and fever – and for the vast majority of people that was all it

GETTY

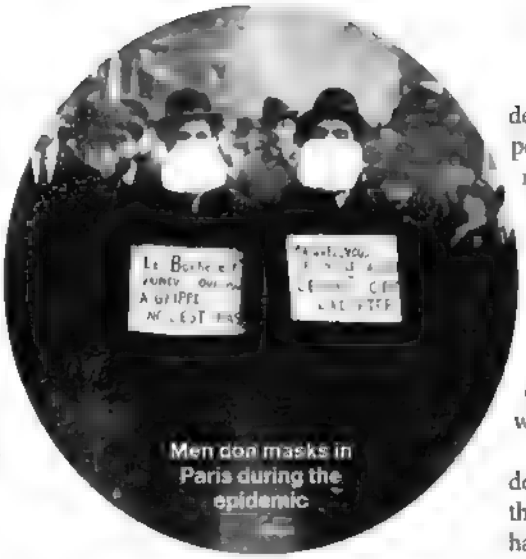
was. In a small proportion of cases, however, the patient's condition quickly deteriorated. Soon their breathing became laboured. They developed two mahogany spots over their cheekbones, from where the ominous colour spread outwards. Mahogany turned to blue, blue to black. Once the black had set in, death was imminent, and – assuming they remained conscious – the victims watched as death gradually claimed them. It was terrifying; no wonder some doubted that the affliction was flu, instead mistaking it for pneumonic plague or even some ghastly form of biowarfare visited upon them by their wartime enemies.

Actually, the culprit was a virus (since identified as influenza A [H1N1]), though that was not at first suspected. The virus was a novel concept in 1918; doctors tended to blame bacteria instead. The first flu vaccine wasn't to be produced until 1936, and antiviral drugs weren't even a gleam in a scientist's eye. In fact, very little of what doctors prescribed had any effect, though careful nursing could make a difference. The most powerful weapon against the infection was social distancing – the umbrella term used to describe all public health measures that slowed the spread, including bans on mass gatherings, the closing of theatres, shops and other public places and the creation of quarantine zones. But these were applied patchily, if at all, and they were often lifted before the danger had passed. The result was that medical facilities and undertakers were overwhelmed.

## An unusual epidemic

In the annals of flu pandemics, the Spanish flu was highly unusual in several ways. First, those who caught it were at least 25 times more likely to die than those who fell ill in any flu pandemic before or since for which detailed records exist. Second, though the very young and the elderly were particularly vulnerable – as with any flu – this one also targeted adults aged between 20 and 40. Third, it spread with unprecedented speed: whereas previous flu pandemics had generally taken three years to circle the globe, this one raced around it in two.

Today, most scientists ascribe these anomalies to the toxic synergy of flu and war. Flu strains that are capable of triggering a pandemic emerge periodically as a result of the flu virus's natural evolution, so it's likely that there would have been a pandemic even if there had been no war. These scientists believe, however, that the war created an environment that exacerbated the pandemic. The massive displacement of people set in train by the conflict, combined with the near-famine conditions that it imposed on large sections of the global population, may have contributed both to the flu's heightened virulence and to its rapid spread. It would be hard to imagine a more effective dissemination mechanism than the large-scale demobilisation of troops that got underway in November 1918, after the signing of the armistice and in the thick of the autumn wave of the pandemic.



Men don masks in Paris during the epidemic

GETTY IMAGES

Those who caught Spanish flu were **at least 25 times more likely to die** than those who fell ill in any flu pandemic before or since

The reason why the 1918 flu targeted 20- to 40-year-olds is still unclear, though some researchers believe that the explanation lies in the immune systems of people of that age range, which had been primed to deal with a very different strain in their youth – the one that caused the previous flu pandemic, the so-called 'Russian flu' that began in 1889.

The British writer Vera Brittain applied the expression "the lost generation" to those well-born, educated young British officers who lost their lives in the war, and who numbered perhaps 35,000. But in sheer numerical terms, the Spanish flu destroyed much more youthful promise. Of more than 200,000 Britons who died of the disease, roughly half were in the prime of life.

And its impact reached far beyond the last recorded case. In the years that followed the pandemic, many of the survivors were plunged into a deep 'melancholia' or depression that doctors now recognise as post-viral syndrome. It's hard to say how much of the global burden of depression at that time was due to the flu, and how much to the war – the condition being a common response to bereavement and social upheaval, too – but there is evidence, based on studies of admissions to psychiatric institutions in neutral countries, that the flu's contribution was significant.

Did this wave of post-flu lassitude and despair help usher in a new pessimism in the arts in the 1920s? It's a question that has received very little attention, but it's not unreasonable to think that it might have done. Some have argued that the Russian flu, which killed a million people, fed the mood of cynicism and ennui that characterised the 1890s. The Spanish flu killed at least 50 times as many and, though we don't know how many suffered from post-viral syndrome in its wake, because the condition was not understood at the time, they are likely to have been far more numerous than their counterparts three decades earlier.

Artists in many domains turned their backs on science and progress in the 1920s. This has generally been attributed to the war and its application of technology to the destruction of life on an industrial scale, but science had also let people down in another way – by failing to prevent the Spanish flu. We can no longer ask those artists what they thought and felt, but it was impossible to live through the pandemic and not be aware of it.

By November 1918, the flu had interrupted normal life in almost every town and village in Britain. The poet TS Eliot was in London that autumn, and he came down with the disease. Once he had recovered, he went back to the poem he had been working on. A vision of a desolate, haunted city entitled *The Waste Land* (1922), it is regarded as one of the most influential poems published in the English language in that decade – indeed, in the entire 20th century. Perhaps a trace of the flu's impact is detectable in Eliot's words.

*"A crowd flowed over London Bridge, so many. I had not thought death had undone so many."*

**Laura Spinney** is an author and journalist. Her new book *Pale Rider: The Spanish Flu of 1918 and How it Changed the World* will be published by Jonathan Cape in June 2017, and is available for pre-order

DISCOVER MORE

**RADIO**

▶ Listen to the BBC World Service programme **Witness** about the Spanish flu at: *bbc.co.uk/programmes/p049wkyk*

# DIAGNOSIS & TREAT

- **7 surprising facts about the history of medicine**
  Discover a septet of curious cures and early advances
- **Taking the sex cure**
  Meet the creator of the 'Celestial Bed' Dr James Graham
- **Pioneer: Louis Pasteur**
  Learn how the French 'father of microbiology' proved germ theory
- **Sickness, salves and skillets**
  Household remedies from the 18th century
- **The ladies with the lamps**
  Florence Nightingale and the pioneering nurses of the Crimean War
- **Under the knife in the 18th century**
  How surgeons studied and operated in the days before anaesthesia
- **Medieval hospitals**
  Explore the almshouses and leper hospitals of the Middle Ages
- **Microbes, magic bullets and morality**
  How the discovery of a cure for syphilis sparked outrage
- **NHS: Britain's healthcare revolution**
  Trace the history of the National Health Service

# MENT

# 7 SURPRISING FACTS ABOUT THE HISTORY OF MEDICINE

Throughout history humans have sought to combat disease, relieve pain and postpone death. **Caroline Rance** shares seven fascinating revelations from medicine's long and often shocking past

Maintaining a comfortable state of health is a goal shared by much of the world's population, past and present – the history of health and medicine weaves a thread connecting us with our ancestors' human experiences. It's easy to assume that studying the history of medicine involves either celebrating the 'eureka' moments of well-known pioneers or laughing at outdated therapies. However, medicine's past features plenty of lesser-known but equally fascinating episodes.

## 1 Some of the earliest named doctors were women

Saqqara is a huge archaeological site about 15 miles south of present-day Cairo. Five millennia ago it was the necropolis for the ancient Egyptian city of Memphis, and remains home to one of the oldest surviving buildings in the world – the step pyramid of Djoser.

A nearby tomb features an image of Merit Ptah, the first female doctor known by name. She lived in approximately 2,700 BC, and hieroglyphs on the tomb describe her as 'the Chief Physician'. That's pretty much all that's known about her career, but the inscription reveals that it was possible for women to hold high-status medical roles in ancient Egypt.

Some 200 years later another doctor, Peseshet, was immortalised on a monument in the tomb of her son Akhet-Hetep (or Akhethetep), a high priest. Peseshet held the title 'overseer of female physicians', suggesting that women doctors weren't just occasional one-offs. Peseshet herself was either a doctor or a director responsible for their organisation and training.

Although the barriers of time and interpretation make it difficult to reconstruct the day-to-day work of Merit Ptah and Peseshet, female doctors appear to have been respected members of ancient Egyptian society.

**The step pyramid of Djoser at Saqqara, Egypt. An image in a nearby tomb depicts a female doctor**

GETTY

Sixth-century BC physician Sushruta. His writings include instructions for cataract surgery

AKG IMAGES/GETTY

## 2 Cataract surgery was undertaken in the sixth century BC

One of the oldest known medical textbooks is the *Sushruta Samhita*, written in Sanskrit in India. The exact date of its creation is tentative, because no original version survives – it is known only from later copies – but the current consensus is that it was written in around 600 BC. Sushruta is thought to have been a physician and teacher working in the north Indian city of Benares (now Varanasi in the state of Uttar Pradesh). His *Samhita* – compilation of knowledge – provides detailed information on medicine, surgery, pharmacology and patient management.

Sushruta advises his students that, however well-read they are, they are not competent to treat disease until they have practical experience. Surgical incisions were to be tried out on the skin of fruits, and the careful extraction of fruit seeds enabled the student to develop the skill of removing foreign bodies from flesh. His students also practised on dead animals and leather bags filled with water before being let loose on real patients.

Among the many surgical procedures described in the *Sushruta Samhita* is cataract surgery. The patient was instructed to look at the tip of his or her nose while the surgeon, holding the patient's eyelids apart with thumb and index finger, used a needle-like instrument to pierce the eyeball from the side. It was then sprinkled with breast milk and the outside of the eye bathed with a herbal medication.

The surgeon used the instrument to scrape out the clouded lens until the eye "assumed the glossiness of a resplendent cloudless sun". During recovery it was important for the patient to avoiding coughing, sneezing, burping or any other action that might cause increased pressure in the eye. If the operation was a success then the patient would regain some useful vision, albeit unfocused

## 3 A 'tree of life' cured scurvy

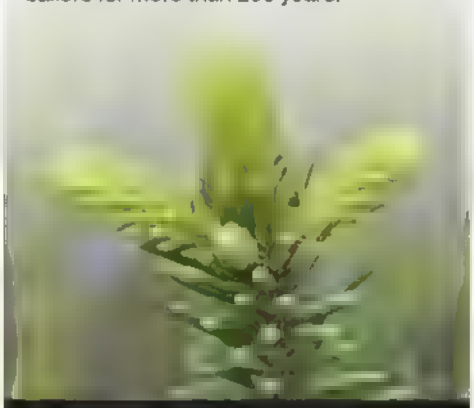
Trapped in ice near Stadacona (the site of present-day Québec City) in 1536, Jacques Cartier's ships weren't going anywhere. The crews, holed up in a makeshift fort with little access to fresh food, came down with a disease so gruesome that "their mouth became stincking, their gummes so rotten, that all the flesh did fall off, even to the rootes of the teeth, which did also almost all fall out". They had scurvy, now known to result from a deficiency of vitamin C. Cartier had no idea what to do.

During his first voyage to Stadacona in 1534, Cartier had kidnapped two young native men, Dom Agaya and Taignoagny, taking them back to France as proof that he had discovered a new territory. Now that they were home, the men and their community had every reason not to trust Cartier – an attitude that he interpreted as "treachery" and "knavery".

In spite of this tension, Dom Agaya showed Cartier how to make a decoction from a tree called Annedda and, although the Frenchmen wondered if it were a plot to poison them, a couple of them tried it – and were cured within days. After that there was such a rush for the medicine that "they were ready to kill one another", and used up a whole large tree.

The species of that tree has not been definitively identified; candidates include eastern white cedar and white spruce. Whatever it was, its nutritional benefits resulted in the sailors' complete cure.

Cartier repaid Dom Agaya by kidnapping him again, along with nine other native people. By the time Cartier next voyaged to Canada, in 1541, most of the prisoners were dead, though Cartier informed their relatives that they were living in style in France. The scurvy cure did not gain widespread recognition and the disease continued to claim the lives of sailors for more than 200 years.



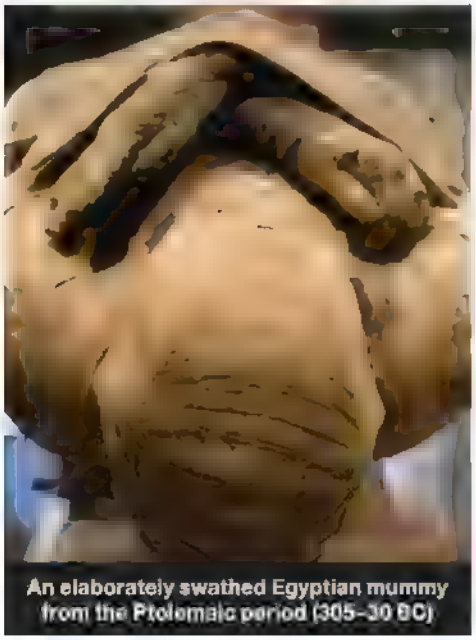
White spruce – possibly the 'Annedda' that cured scurvy among Jacques Cartier's crew

## 4 The mummy returned... as medicine

'Liquid of the dead' might sound like the name of a dubious rock band, but in fact it's a substance described in the writings of the 13th-century translator Gerard de Sabloneta – a bituminous matter that exuded from embalmed corpses. This liquid became popular as a medicine for bruising and blood loss – and the corpses themselves became involved, too.

A bitumen called pissasphalt was included in ancient Greek and Roman medical texts . A particularly prized source was found near Darábjerd in Persia, where the local word *mumiya* described its waxy texture; this appeared in medieval Persian and Arabic medical texts. In Europe, however, something got lost in translation. Influenced by a belief that the ancient Egyptians used bitumen in embalming, practitioners began to see mummies as an alternative source of the medicine, now called 'mumia'. Merchants near the ancient Egyptian sepulchres cashed in, and desiccated flesh became a substitute for the exuded substances.

By the early 16th century, standards had lowered to the extent that something sold as 'mumia' could come from any corpse. It was a distasteful business that had its vocal detractors. French surgeon Ambroise Paré (1510–90) objected to mumia on the grounds that you never knew what you were getting. More importantly, he noted that the medicine was ineffective. Its popularity declined thereafter, though it remained available to a limited extent into the 20th century.



An elaborately swathed Egyptian mummy from the Ptolemaic period (305–30 BC)

Seishu Hanaoka operates on an anaesthetised patient in an early 19th-century illustration

## 5 General anaesthesia was used in cancer surgery in early 19th-century Japan

By 1804, Kan Aiya was 60 years old, and had lost many loved ones to breast cancer. She had seen her sisters die of the cruel disease, so when a tumour formed in her left breast she was well aware of the likely outcome. For her, however, there was a chance of survival – an operation. And she was in the best possible place to undergo surgery at that time: Japan.

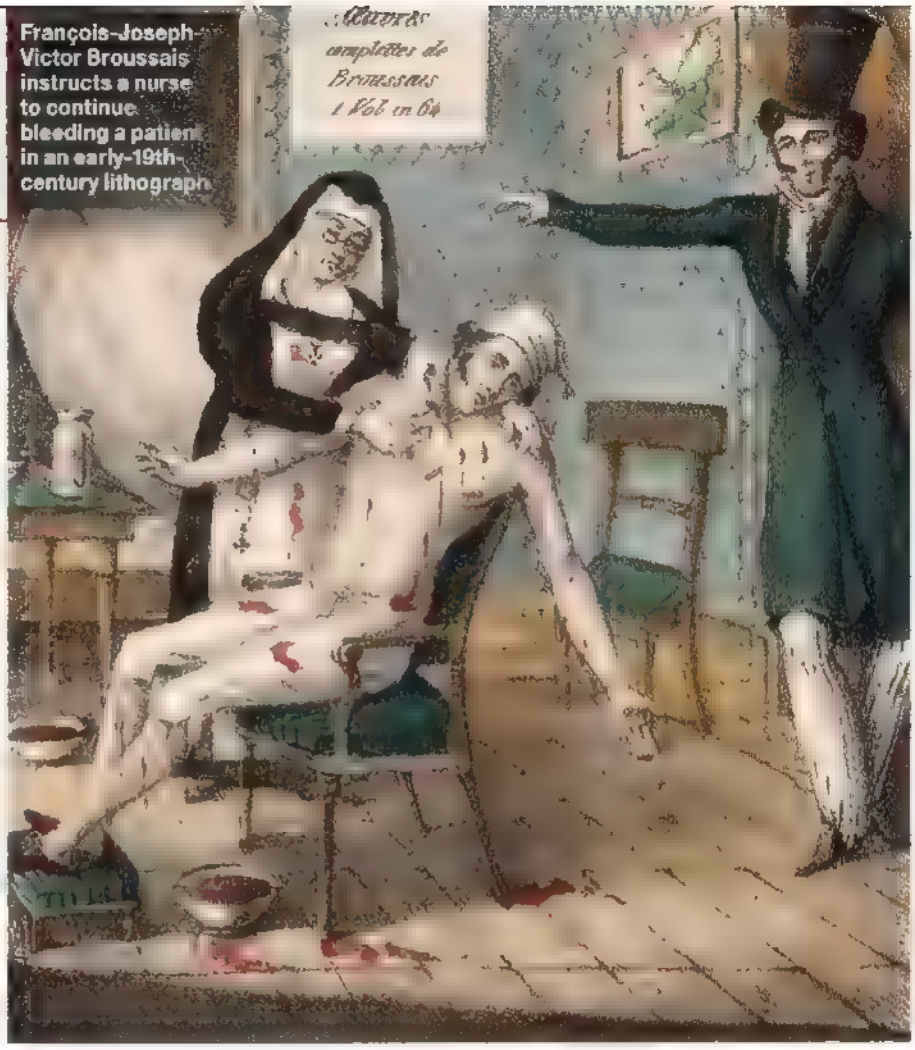
Seishu Hanaoka (1760–1835) had studied medicine in Kyoto and set up a practice in his hometown of Hirayama. He became interested in the idea of anaesthesia, having encountered stories of a compound drug developed by a late second and early third-century Chinese surgeon, Houa T'o, that enabled patients to sleep through the pain. Hanaoka experimented with similar formulae and produced *mafutsusan*, a potent hot drink. Among other botanical ingredients, it contained the plants 'devil's trumpet' (*Datura metel* or *Datura alba*), monkshood and *Angelica decursiva*, all of which contain potent physiologically active substances.

*Mafutsusan* had quite a kick – if you glugged it down willy-nilly you would probably die, but if administered at the correct dosage it rendered patients unconscious for between six and 24 hours, allowing ample time for surgery.

On 13 October 1804, Hanaoka excised Kan Aiya's tumour while she was under general anaesthesia. He went on to operate on at least 150 more breast-cancer patients as well as people with other conditions. Kan Aiya is thought to have died of her disease the following year, but had at least been spared the agony that still characterised surgery in the west at that time

WELLCOME LIBRARY/ALAMY

# 6 A 'leech craze' spread through 19th-century Europe




François-Joseph-Victor Broussais instructs a nurse to continue bleeding a patient in an early-19th-century lithograph

The medicinal leech has been in use for thousands of years, and is even today used to help restore venous circulation after reconstructive surgery. But it was in the early 19th century that the leech really soared in popularity. At the forefront of the leech renaissance was French physician François-Joseph-Victor Broussais (1772–1838), who postulated that all disease stemmed from local inflammation and were treatable by bloodletting. The 'leech craze' saw barrels of the creatures shipped across the globe, wild leech populations decimated almost to extinction, and the establishment of leech farms.

Leeches had advantages over the common practice of bloodletting using a lancet: the loss of blood was more gradual and less of a shock for those of delicate constitution. And because Broussais's followers used leeches in place of all the other medicines at the 19th-century physician's disposal, patients were spared some harsh remedies that might otherwise have made them feel worse. In 1822, a British surgeon called Rees Price coined the term sangui-suction for leech therapy.

# 7 Ugandan surgeons developed life-saving caesarean operations for women in childbirth

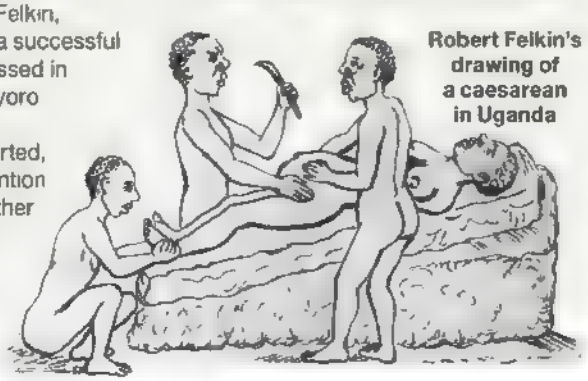
In 1884, the caesarean section was not a new idea. It dated from the time of the Caesars, in fact, when Roman law required the procedure to be carried out in the event of a woman's death in childbirth.

Over the centuries, reports occasionally surfaced of caesarean sections saving the lives of both mother and baby but, even after the introduction of antiseptic methods and anaesthesia, caesareans remained a dangerous last resort. So Edinburgh surgeons were surprised to hear a lecture by Robert Felkin, a missionary doctor, about a successful operation that he had witnessed in the African kingdom of Bunyoro Kitara five years earlier.

The operation, Felkin reported, was carried out with the intention of saving both lives. The mother was partially anaesthetised with banana wine. The surgeon also used this wine to wash the surgical site and his own hands, suggesting awareness of the need for infection control measures. He then made a vertical incision, going through the abdominal wall and part of the uterine wall, before further dividing the uterine wall enough to take out the baby. The operation also involved removing the placenta and squeezing the uterus to promote contraction.

The process of dressing the incision was also highly developed: the surgeon used seven polished iron spikes to bring together the edges of the wound, tying them in place with bark-cloth string. He then applied a thick layer of herbal paste and covered this with a warm banana leaf held in place with a bandage. According to Felkin's account, the mother and her baby were still doing well when he left the village 11 days later.

Although caesarean operations had been performed in Africa by white surgeons before this date, the procedure appeared to have been developed independently by the Banyoro people – a somewhat discomfiting realisation for a British audience more familiar with colonial representations of 'savages'



Robert Felkin's drawing of a caesarean in Uganda

**Caroline Rance** is a writer who specialises in the history of medical advertising and health fraud. Her latest book is *The History of Medicine in 100 Facts* (Amberley Publishing, 2015)

*The Exhibition Stare-Case* (c1800) by Thomas Rowlandson portrays crowds at the Royal Academy's annual exhibition at Somerset House. The statue of Venus may refer to Graham's most celebrated 'Goddess of Health', Emma Hamilton

# TAKING THE SEX CURE

Dr James Graham won renown in the late 18th century as the 'world's first sex therapist' – only to be dubbed the 'emperor of quacks'. **Lydia Syson** argues that his infamy has overshadowed his truly enlightened ideas

The single most useful piece of advice that Dr James Graham could give his fellow Georgians would be that they should wash their genitals.

"I would… proclaim… with a loud and affectionate voice, that bathing their private parts with cold water thoroughly… was in my opinion of the highest importance to the preservation of their health and strength, beauty, and brilliancy, bodily and intellectual."

Morning and night was the recommended regime, and always – always – after sex. Spouses would be unlikely to stray once they were used to the sweetness of genital hygiene. And "the rich purse of Venus, the manly standard of love" would always be ready to obey "the summons of Hymen!"

Tall, handsome and very persuasive, James Graham (1745–94) had shot to national fame even before he began to lecture on the subject of procreation. His extraordinary electro-magnetic medical establishment, the Temple of Health, opened in London in July 1780. At one of the grandest houses in the Adelphi, a fashionable Adam brothers development overlooking the Thames, he offered health, art and science in equal measure. Well-heeled audiences arrived in such numbers that a one-way system had to be enforced for their carriages. "Nothing could be more superb," declared one visitor, awestruck at Graham's spectacular display. The doctor promised to "draw down… the lightning from the clouds of heaven".

Electricity sparkled through gilded glass apparatus of unprecedented magnificence. While exotic perfumes and distant music seeped into every candlelit room, huge fiery dragons, vast spheres, colourful prismatic pillars and spiralling columns were mirrored in each shiny surface. Graham's lectures were performed with the help of a succession of Rosy Goddesses of Health – one of them a beautiful young unknown who eventually became Emma Hamilton, Nelson's mistress.

The doctor's offers of sexual enlightenment were, at first, relatively discreet. Childless married couples could buy sealed copies of "private medical advice". In the seclusion of their own bedrooms they learned how to populate the nation with a race of super-humans. Florid prose promoted sexual ecstasy born of marital harmony, shared music-making and family prayers. Vegetarianism, fresh air and exercise were also recommended. Most important of all, of course, was scrupulous genital hygiene. But if that didn't work, there was always the magnetico-electrical Celestial Bed. If James Graham is remembered now at all, it is for this extraordinary piece of furniture (see box, overleaf).

> Graham's florid prose promoted **sexual ecstasy born of marital harmony**

## The Temple of Prolific Hymen

Graham's Adelphi show was such a success that he opened a second venue in Pall Mall: the Temple of Prolific Hymen. Here he launched his *Lecture on Generation* and threw everything he could muster into a vastly improved version of the Celestial Bed. It was a fantasy realised – but a financial disaster. Even charging £50 a night, he could never recoup its enormous costs. And though it ensured a lasting place for James Graham in the footnotes of history, the infamous bed has long eclipsed many other fascinating aspects of his work – aspects that make him such a quintessential man of the Enlightenment.

Graham embraced all of the exciting new developments of the 18th century and

GETTY

# The great Celestial Bed:
## *A fertility aid from the heavens*

The world's most erotic and elaborate fertility aid was unveiled in the spring of 1781 after months of fanfare. Measuring 12 by 9 feet (3.7 by 2.7 metres), the "medico, magnetico, musico, electrical bed" was canopied by a vast dome covered in musical automata, festoons of fresh flowers, and a pair of live turtle doves.

At its summit a statue of Hymen, god of marriage, held aloft a torch "flaming with electrical fire". As mechanical musicians played, stimulating oriental fragrances and "aethereal" gases were released from a reservoir inside the dome. Its underside was lined with mirrors, reflecting streams of light playing over the pillows, not to mention every antic of the lovers. A tilting inner bed frame encouraged the "gentleman" to "follow his lady down-hill" to help conception. Meanwhile, a circle of magnets arranged underneath provided a "sweet undulating, titillating, vibratory, soul-dissolving, marrow-melting motion". Their power was probably more symbolic than scientific.

Even the mattresses evoked fecundity. They were stuffed with horse hair from the finest stallions' tails, and draped with silky sheets – those 'patients' using the bed could choose the shade best suited to their complexions.

The exertions of "the happy pair" set off more music. Organ pipes supporting the dome breathed out "celestial sounds". These increased in intensity with the ardour of Graham's patients, finally pealing forth in a sublime, life-creating climax. The whole electrified creation was insulated by 40 glittering, multi-coloured pillars of cut glass.

Picked out in burnished gold and sparkling with electricity, the doctor's favourite commandment to his patients appeared above a clockwork tableau at the head of the bed: "Be fruitful, multiply and replenish the earth!"

*'Tho' your embers should be dead,*
*Stretch on his celestial bed,*
*Soon you'll feel the vital flame,*
*Rushing thro' your icy frame!'*
*The Celestial Beds, 1781*

A contemporary image of Graham's Celestial Bed, with a 'Rosy Goddess of Health'. Patients paid £50 per night to use this purported fertility aid

remade them in compellingly original forms. Electricity was the most thrilling and visible of the era's scientific advances, and the "emperor of quacks" – as one playwright dubbed him – was one of a number of medics convinced of its therapeutic value. Magnetism also already had a reputation for healing, and the ambitious doctor was quick to capitalise on this, too.

But the most fashionable branch of natural philosophy was pneumatic chemistry – the science of gases. Barely had Joseph Priestley identified oxygen and nitrous oxide than Graham was using them in his treatments, along with ether. He advertised artificially produced medicinal "airs" long before the chemist Humphry Davy's experiments in the field.

Always alert to the effects of the imagination on bodily health, Graham also pioneered musical therapy. His Temples echoed to the eerie tones of the glass harmonica, an instrument invented by Benjamin Franklin. When it came to interior decoration, the doctor was equally inventive. New lighting techniques borrowed from the theatre illuminated feats of glass-making wizardry to stunning effect.

Graham was a master showman in an age that adored spectacle. Yet, beneath a glitzy surface, his ideas were often politically progressive. He used his lectures and advertising to denounce prostitution and speak out in favour of educating women. He condemned the bloodshed of the American War of Independence and even anticipated the anti-slavery movement.

### Genius for self-promotion

Graham courted celebrity and adored the limelight. Thanks to his genius for self-promotion, he made the most of a burgeoning print culture. But if the newspapers were where he made himself, they were also where he was ruined. While the beau monde opened their purses, the satirists sharpened their quills. Graham quickly became a sign of his times.

The doctor used to argue that, like the wet nose of a dog, "a cold, glowing, full, liquid, balmy firmness… of the genital parts" was an indicator of bodily perfection. Just as he touted the conditions of the genitals as the barometer of physical well-being, so he himself came to stand for the moral health of the nation.

Graham claimed he had always suffered from **"a too eccentric and too expensive imagination"**

Satirists considering the ailments of the state found a malleable image in the "emperor of quacks". In poetry, prints, newspaper skits, debating societies and especially on stage – even as a singing wooden marionette – the figure of the 'electric empiric' was used to anatomise fashion, luxury, social climbing and public credulity. Major political events such as the Gordon Riots, as well as topical concerns such as polygamy, were all considered with reference to Graham.

He was as typical of the 18th century as any of its great scientists, writers and philosophers. It was a period stuffed with little men trying to make it big in a vibrantly commercial world. The self-proclaimed philosopher of the soul might have been an inventive entrepreneur, but financial management was not his strong point. He never acquired the fortune he felt he so richly deserved. As he lamented to Countess Spencer, a patron who rejected him when his reputation became tarnished, he had always suffered from "a too eccentric and too expensive imagination". H

**Lydia Syson** is an RLF Writing Fellow at the Courtauld Institute

DISCOVER MORE

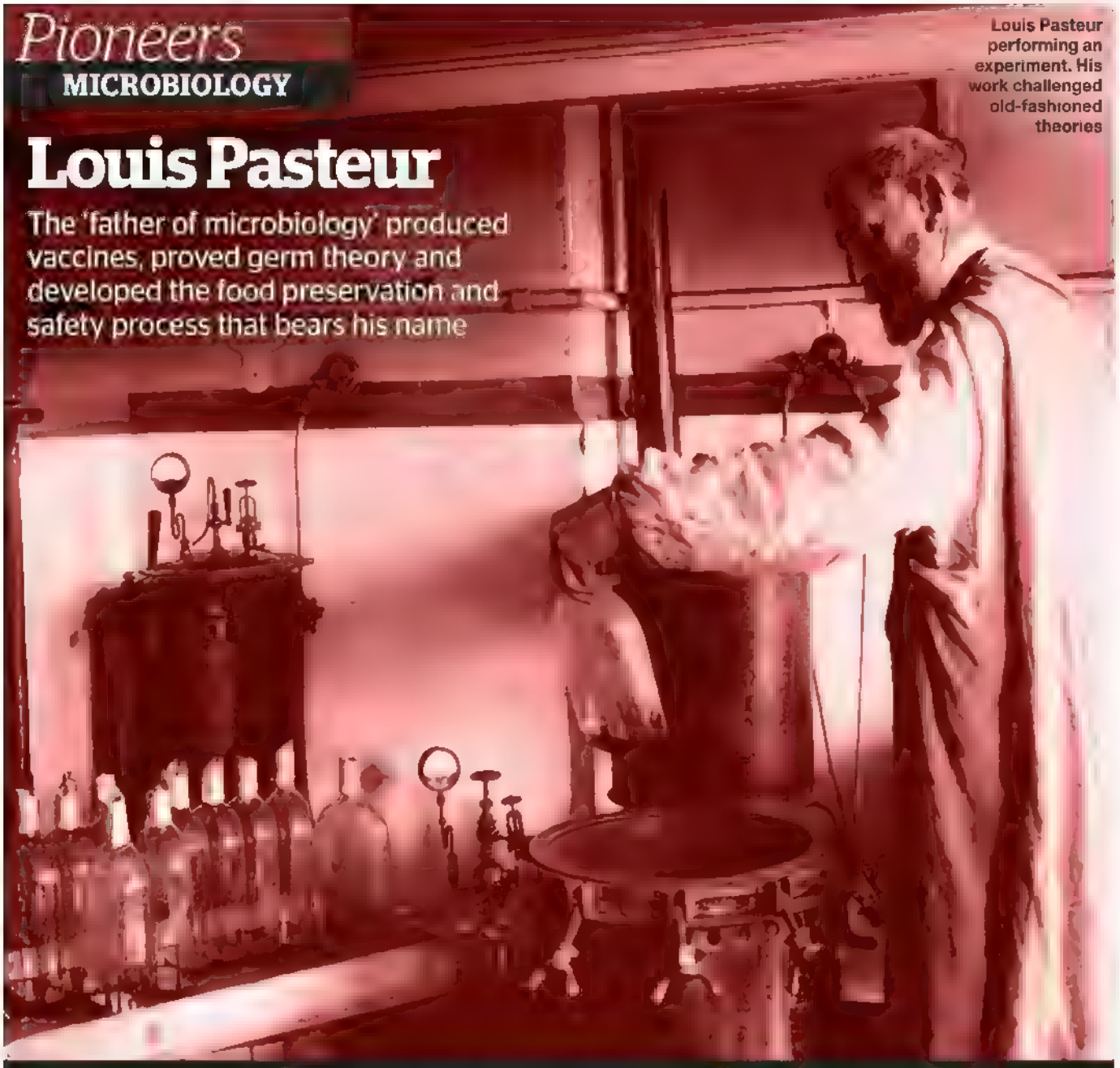
BOOK

▶ **Doctor of Love: James Graham and his Celestial Bed** by Lydia Syson (Alma Books, 2008)

GETTY

# Louis Pasteur

The 'father of microbiology' produced vaccines, proved germ theory and developed the food preservation and safety process that bears his name



Louis Pasteur performing an experiment. His work challenged old-fashioned theories

GETTY

One of the giants of medical science, Pasteur did more than anyone to get us all washing our hands – and his name lives on in the process he devised for heating milk, wine and beer to a high temperature for a short time to kill harmful microorganisms.

Louis Pasteur (1822–95) came from a humble family in the Jura region of eastern France. In early life he was a decidedly average student (though a talented artist) but once he applied himself to scientific studies his rise was fast, leading to a succession of increasingly prestigious scientific appointments.

Almost all of Pasteur's innovations addressed urgent practical and economic needs of the day; pasteurisation, for example, curbed the spoilage of wine and milk. He defeated diseases of silkworms that caused hardship to French producers; he produced vaccines for chicken cholera, anthrax and swine erysipelas, aiding farmers; and he helped to develop a successful rabies vaccine.

Pasteur is known as the 'father of microbiology' not just because that was (mostly) his field but also because he validated germ theory, his experiments providing evidence to counter old-fashioned beliefs that disease could be caused by 'bad air' or even the spontaneous generation of organisms. Indeed, Pasteur did more than anyone else to prove the existence of germs.

> Pasteur, the 'father of microbiology', did more than anyone else to **prove the existence of germs**

The achievements were, it must be said, more heroic than the man. Pasteur was an arrogant authoritarian who provoked student revolts. He conducted long feuds with professional rivals, and notoriously ordered his family to keep his notebooks secret after his death because, it seems, he sometimes exaggerated results.

But he also became a much-lauded celebrity who, in his sixties, was honoured with a medical establishment named after him. Since its foundation in 1887, L'Institut Pasteur has been behind some of the greatest medical advances, and to this day remains at the sharp end of the war on infectious disease.

*Words: Eugene Byrne*

# SICKNESS, SALVES AND SKILLETS

**Elaine Leong** examines an 18th-century inventory that paints a vivid picture of the medical knowledge and cures available in early modern homes

In October 1711, Elizabeth Freke, an elderly gentlewoman living in West Bilney, Norfolk, busied herself planning a trip to London. At the age of 69, Elizabeth – ever the pessimist – decided to make an inventory of "some of the best things" in her house, just in case she was not to return home again. The room-by-room inventory, written into her notebook of remembrances and culinary and medical recipes, took four days to complete. It records Elizabeth's worldly possessions, ranging from jewellery, clothing, furniture and linens to pots and pans in the kitchen.

In the midst of this detailed list, Elizabeth reveals to us that the five locked cupboards in her closet contained "several bottles of cordiall water 114 quarts; of pintts of cordy water 36. And of the severall sorts of sirrups is 56 quarts and pints".

Though costly silverware and books have an obvious place on any list of the "best things" in one's household, the inclusion of quarts and pints of medicinal cordial waters and syrups is, perhaps, surprising to modern readers. In fact, Elizabeth's stockpile of drugs is reflective of the central place that health care and medicine played in the lives of householders, and the wide range of medical activities going on in homes of the early modern period (c1500–1800).

During this period, men and women were attuned to their bodies and bodily changes, and were constantly searching for indications of health and of possible illness. Following ancient medical theories, most believed that their bodies comprised four humours: blood, phlegm, black bile and yellow bile. Sickness was seen as an imbalance of these humours. Any bodily ailments, from internal pains to surface boils and bumps, could be an indication that something was not quite in sync.

Remedies to rebalance one's body came in a variety of forms, including exercise, diet and changing one's environment – by, for example, exchanging the polluted air of the city for the fresh air of the countryside. Taking medicines and drugs was simply one of the ways the imbalance of bodily humours might be addressed.

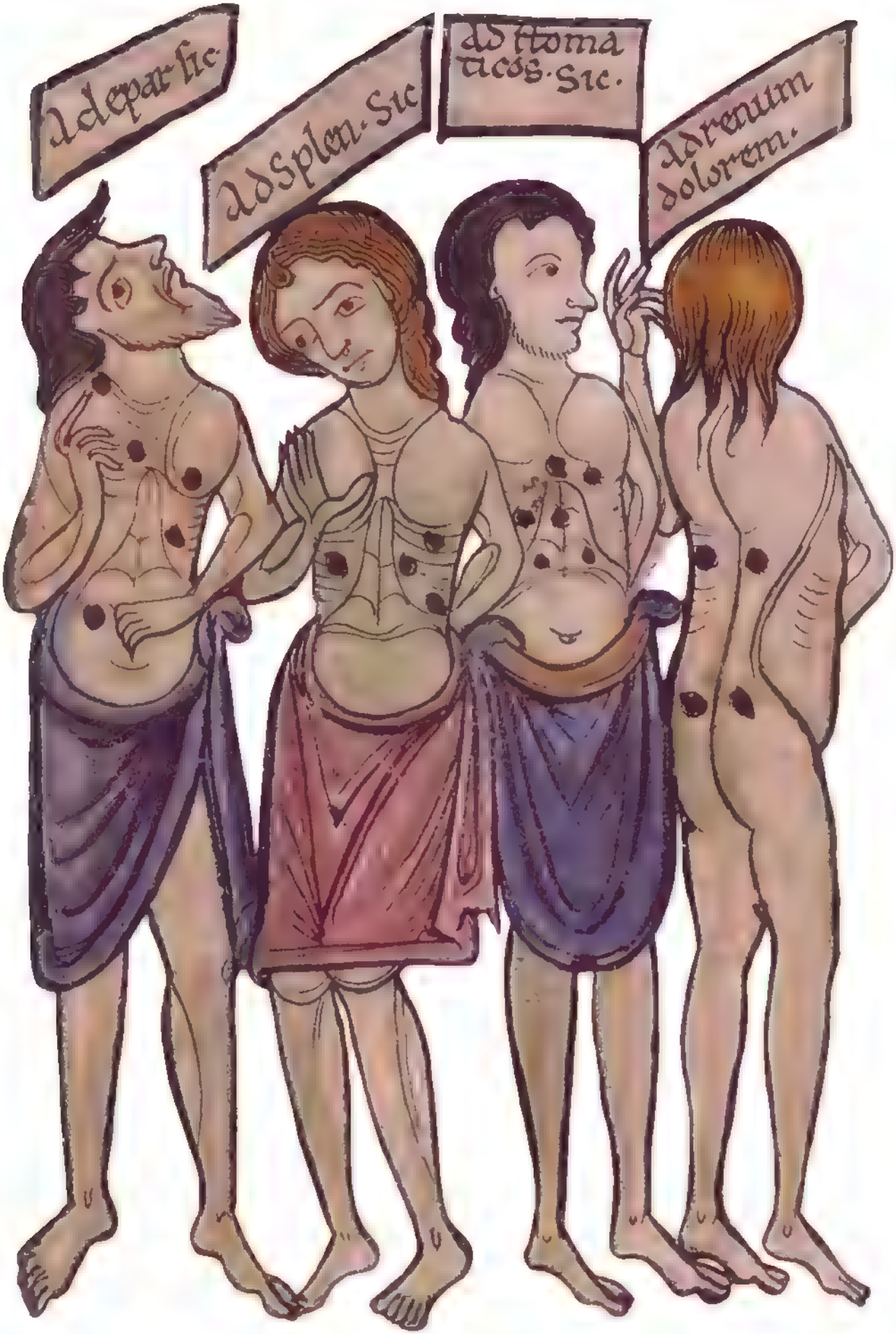
Bodily ailments, from internal pains to boils and bumps, could indicate that **humours were not in sync**

When it came to health-care options, there was a wide array of choices in both commercial and non-commercial spheres. If people were willing to open their purses they could seek help, advice and services from a variety of practitioners ranging from university-trained physicians to the itinerant mountebank touting his nostrums on the market square. For those who preferred to save their pennies, family, friends and neighbours, including the local vicar, were often willing to recommend tried and tested remedies.

## Call the midwife

The decision of whom to ask for help was as much dependent on the kind of ailment suffered as on economic, geographic and social factors. In cases of female health issues and childbirth, women would have sought out the local midwife. For particular ailments such as cataracts or sexually transmitted diseases, people might seek out specialists of good repute. These specialists, of whom some were itinerant practitioners, were more likely to have earned their reputation through their experience of helping patients than from fancy medical degrees.

Early modern men and women tended to self-diagnose and call in the appropriate practitioner based on their own judgment. For example, on 10 August 1708 Elizabeth




BRITISH LIBRARY – BRIDGEMAN

**A 12th-century image indicates points where patients should be cauterised to correct imbalances of the four 'humours': blood, phlegm, black bile and yellow bile. In the 18th century, it was still widely believed that health was linked to the humours**

THE BRITISH LIBRARY BRIDGEMAN

TOP **Elizabeth Freke's journal lists cordials and syrups in her store cupboard**
BOTTOM **Angelica (left), bullace (above right) and elder (below right, as berries and blossoms) were three of the plants used to make household remedies**

Freke, suffering from a head ailment and "tissick" (a lung complaint), decided to call the local vicar, Edward Smith of Winch, to let her blood and cut her hair. Both of these measures were intended to harmonise the humoural balance in her body.

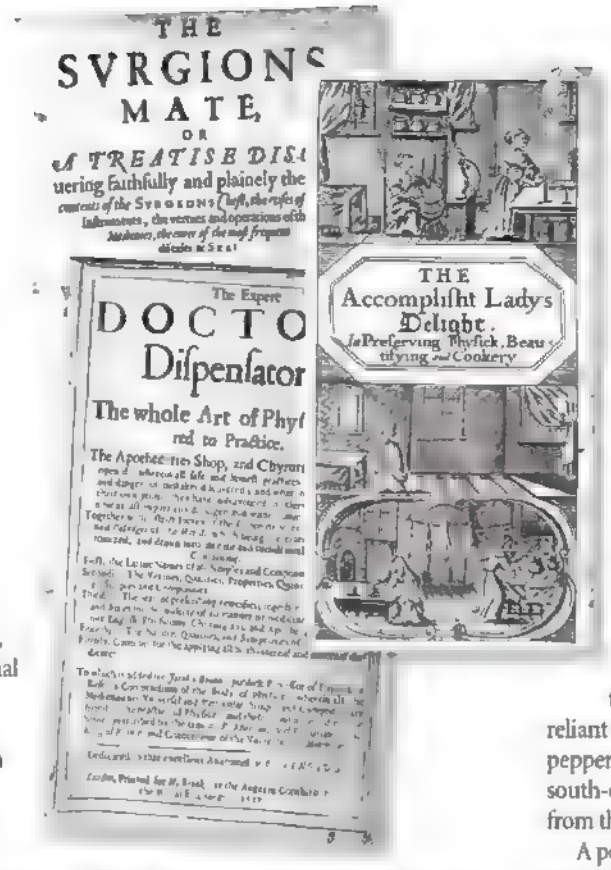
Despite the assortment of available practitioners vying for their custom, many householders elected to first deal with sicknesses themselves before venturing out to seek help. As many domestic manuals attest, housewives and housekeepers were expected to possess basic medical skills and knowledge of the human body. Contemporary gardening books, such as Leonard Meager's *The New Art of Gardening with the Gardener's Almanack*, advised on the different types of medicinal herbs suitable for the physic garden. In addition, householders were also able to buy basic medical guides and compendia of recipes containing instructions to make a range of medical remedies.

Bottles of general medicines and the information to make more specialised drugs were kept on hand, just in case they might be called to use. Elizabeth Freke's five locked cupboards of medicines provide an example, albeit perhaps more enthusiastic than some, of the householder's preparation for the possible onslaught of ailments and illnesses. Her collection of syrups and cordial waters dealt with a variety of bodily complaints, and many of these – such as the *elixir salutis* or *aqua mirabilis* – were common panaceas or cure-alls. For more specific ailments, such as agues, fevers, diseases such as 'the small pox' or maladies of particular body areas, Freke kept a selection of information in the form of medical recipes, and would no doubt have made up these medicines as needed.

When taken together, the cupboards of actual medicines and the 'virtual' medicine chest in the form of her recipe notebook were designed to deal with most common ailments of the period.

## Producing medicines

The home was the site for a range of medical activities. Householders were not only adept at caring and nursing the sick but also accustomed to monitoring their own and their family's bodies, and making health-related decisions. One of the main medical activities that occupied many householders was the making up of medicinal waters, syrups, juleps and salves. Many of these substances had a relatively simple production process involving easily obtainable herbs and spices, made using the pots and pans of the early modern kitchen.




**In the 17th century the blossoming print trade made a wide range of medical books available to the householder, including *The Accomplisht Ladys Delight*, which featured advice on "physick"**

Medicinal waters could be made either by boiling and seeping the ingredients in a large pot with water or alcohol, or by distillation. The latter was a more time-consuming process and would have required specialist equipment such as a limbeck (alembic) or glass still. The producer usually had to pound the herbs and infuse them overnight in the liquid before distilling the next day. A number of the medicines listed in Elizabeth's inventory were made using this process. Such medicines were often sweetened with honey or sugar.

Salves and plasters were made by dissolving the ingredients in a skillet with fat. These were either applied directly onto the affected part or spread onto a cloth that was then bound to the body part as required. Elizabeth's list indicates that she owned brass and metal skillets, frying pans, chafing dishes and kettles, pestles and mortars, and distillation equipment including a copper and a pewter limbeck, all of which could be used to produce medicines.

Many of the substances used in the early modern pharmacopoeia are common herbs and spices still in use today, such as rose, rosemary, angelica, senna, cinnamon and nutmeg. Elizabeth Freke had syrups made with the familiar damsons, elderberries, purslane and turnips, as well as the less-familiar buckthorn and bullace. Her cupboards also contained rosemary water, lemon water and brandy, tincture of lavender, syrup of saffron and tincture of nutmegs.

The different types of ingredients used highlight the importance of international trade networks during the period. English households were reliant on foreign imports for spices such as pepper, nutmeg, cloves and cinnamon from south-east Asia, and substances such as sugar from the Caribbean.

A peer into any early modern medicine chest is likely to reveal a mixture of homemade tinctures lying alongside bottles of ready-made remedies and packets of single spices obtained from apothecaries, grocers, spicers and travelling drug-sellers. As with other aspects of health care, householders were content to mix what was commercially available with what they could produce themselves in their search to alleviate their aches and pains.

In many ways, Elizabeth Freke's five locked cupboards of medicines served a function in her household not dissimilar from that of modern-day medicinal cupboards. Both contain drugs designed to deal with a range of everyday ailments, and both are prepared and gathered together for those moments when a cough, a cold or a headache hits a family member.

Then, as now, it pays to be prepared. Whereas preparation today might involve a walk to the local chemist, for householders such as Elizabeth Freke it meant a great deal more work. This investment in time, resources and energy makes the medicines of her day ideal candidates for Elizabeth's list of "best things". ■

One woman, suffering from a head ailment and "tissick", called the vicar to **let her blood and cut her hair**

**Elaine Leong** is a researcher at the Max Planck Institute for the History of Science, Berlin, working on the project *Treasuries for Health: Making Recipe Knowledge in the Early Modern Household*

DISCOVER MORE

BOOK

▶ **The Remembrances of Elizabeth Freke, 1671–1714**, ed Raymond Anselment (Cambridge University Press, 2002)

WELLCOME IMAGES

# THE LADIES THE

A c1855 photograph of a nurse tending to a wounded soldier in Crimea

# WITH LAMPS

Florence Nightingale has become near-legendary in the annals of early nursing. But as **Mark Bostridge** reveals, the British effort in Crimea involved far more than one lamp-bearing lady

Florence Nightingale is rightly remembered as a heroine of the Crimean War, but it's often forgotten that she was not the only nurse to tend to the wounded soldiers around the Black Sea. A remarkable document survives today at the Florence Nightingale Museum in London. *The Register of Nurses Sent to Military Hospitals in the East*, held in the museum, has now been digitised, and offers an intriguing if limited insight into the lives of the 229 women who left Britain between 1854 and 1856 to nurse during the Crimean War. The body of the handwritten register contains information under the headings Name; Age; Residence; Where Trained or Practised; Guarantees and Character; When and Where Sent; and Remarks.

On page one you'll find the entry for Florence Nightingale herself. Nightingale was superintendent of this vital new experiment (a female nursing corps), not only by virtue of her administrative and organisational brilliance but also through the web of social and governmental connections that had brought her to the attention of both the prime minister, Lord Palmerston, and the secretary-at-war, Sidney Herbert.

Nightingale's iconic status has largely blotted from the historical record the existence, let alone the achievements, of other, more ordinary women who nursed during the Crimean War. Furthermore, these women were assigned to a range of hospitals in Turkey and Crimea; the larger proportion of them nursed outside the area of Nightingale's jurisdiction, so without reference to her ideas of proper professional practice.

## Ready to serve on the front

Testimony to the enthusiasm with which the call for female nurses was received is found in letters from women applying to be sent out east, a large collection of which is held at the National Archives at Kew. An average wage of 18 shillings a week was a powerful incentive for some, including the recently widowed.

Mrs Mary Jones, left a widow at 50, attempted to convince the selection committee of her religious orthodoxy ("Am a firm Protestant") as well as of her personal hardiness ("I walked through Wilts, Hants and Surrey this summer for amusement … from twelve to fifteen miles a day…"). For others, though, there was the opportunity to impress with details of experience in public or private nursing institutions. Mary Ann Shipway, for instance, wrote that she had been a nurse at a lunatic asylum, and had also several years' service in the medical and surgical wards of hospitals in Bristol. Tight controls over numbers, however, meant that many of these prospective Crimean nurses were to be disappointed.

> The professional nurses were regarded as being on the **same level as domestic servants**

There were, of course, a significant number of unofficial nurses who travelled to the east under their own steam. Elizabeth Evans, wife of Private Evans of the Fourth Regiment of Foot, was later awarded the Crimean Medal after nursing in a hospital attached to her husband's regiment. Most famously, Jamaican-born Mary Seacole, celebrated for her hotel at Spring Hill, won the gratitude of British soldiers for her hospitality and skills as a nurse and doctor. She successfully treated diarrhoea, dysentery and cholera with herbal remedies derived from traditional Caribbean medicine.

However, the officially sanctioned nursing corps fell into three broad groups. First, women from religious communities, including the Sisters of Mercy who formed an important component in Nightingale's first party of October 1854 and in subsequent contingents.

**Florence Nightingale, shown c1845, whose hospital reforms saved many lives**

GETTY BRIDGEMAN

Despite controversy aroused back in England from anti-Catholic feeling, and the accusations of proselytism levelled against them, these nuns drew on extensive experience of caring for the sick. The Crimean journals of three Sisters of Mercy, Sisters Aloysius Doyle and Joseph Croke and Mother Francis Bridgeman (who clashed with Nightingale), revealed the extent of their nursing knowledge - the practice of 'stuping', for instance: a hot compress and chloroform placed on the stomach to relieve cholera sufferers – and the incidental horrors of Crimean life, such as the droves of rats "dancing and capering" about the rooms and over the nurses' beds.

The second group comprised the lady volunteers, unpaid but forced at first to wear the same disfiguring uniform as the ordinary nurses – a "dirty-looking, dressing-gown sort of a dress, a night cap, a blue checked apron, and a hospital badge across one's shoulder", as Martha Clough, who later took charge of the regimental hospital of the Highland Brigade, described it. Mary Stanley was one of these ladies, the leader of the second group of nurses to leave England, who arrived at Balaklava General Hospital in January 1855 against Nightingale's wishes, and eventually introduced female nursing to the hospitals at Koulali (near Scutari, today Üsküdar, across the Bosphorus from Istanbul).

## Hired help versus noble nurses

There was no grading among the nurses, and nothing to reflect the class differences between the lady volunteers and their paid counterparts, though a later set of regulations emphasises that paid nurses were to "remain in exactly the same relative position" to the ladies "in which they were in England". Relations between the two were, consequently, often difficult. Fanny Taylor, daughter of a clergyman and a member of Mary Stanley's party, was appalled by the language and insolence of the hired nurses.

The personal stories of many of this third group in the nursing corps, the professional and private nurses who were regarded as being on the same level as domestic servants, are illustrations of these difficulties. For instance Jane Butler, who had worked before the war as a surgical nurse at Guy's Hospital, was dismissed at the end of 1855 for misconduct, implying personality differences between the nurse and her superiors.

Drunkenness was another offence punishable by dismissal. In June 1855 Jane Gibson, who had been described as possessing "superior abilities" by a house surgeon at St Thomas's, was sent home from Balaklava for being intoxicated while treating a patient.

**Florence Nightingale in discussion with an army officer in the hospital at Scutari in 1856. Her efforts to improve standards of cleanliness on wards reduced mortality rates among injured soldiers**

GETTY

What were the nursing responsibilities of this new corps? The greater proportion of the work consisted, as an official circular put it, "of every branch of work which lies within a woman's province", namely washing, sewing, cooking, housekeeping, and cleaning. Added to this was administering medicines under doctor's instructions, and the all-important requirement of night nursing. There is little evidence of any surgical nursing.

The later experiences of many of the women who nursed in the Crimean War are difficult to trace. A few came home and published accounts of their lives in Crimea; Elizabeth Davis's autobiography appeared in 1857, and Sarah Anne Terrot, who nursed at Scutari, published her diary under the title *Nurse Sarah Anne*. The subsequent careers of many others are lost to history.

One Crimean nurse who did re-emerge briefly onto the public record at the end of her life was Emma Fagg. Her career had hardly been glorious. According to the nurses' register she had been dismissed as incompetent in January 1855, and had returned to Kent to work as a private nurse. In 1907 the Daily Express reported that Fagg, who had been among the first party of nurses to go to Scutari, was still alive at 81, living in Thanet Union Workhouse, and that she had lost none of her vigour. She died in March 1913, and was buried at St Peter's, Broadstairs – the last of Florence Nightingale's famous expedition of October 1854 to die.

**Mark Bostridge** is a writer, critic and biographer, author of *Florence Nightingale: The Woman and Her Legend* (Penguin, 2009)

## DISCOVER MORE

**BOOK**

▶ **The Crimean Journals of the Sisters of Mercy 1854–56**, edited by Maria Luddy (Four Courts Press, 2004)

**VISIT**

▶ **Florence Nightingale Museum,** St Thomas' Hospital, 2 Lambeth Palace Road, London *florence-nightingale.co.uk*

# UNDER THE KNIFE

## IN THE 18TH CENTURY

Without sterile equipment, antibiotics or anaesthetics, surgery in the Georgian era was a last resort, being both agonising and extremely risky. **Daniel Hahn** considers how early surgeons carried out their trade

Number 28 Leicester Square, an affluent address in late-18th-century London, was the home of Scottish born surgeon John Hunter and his wife Anne. With an unremarkable exterior, the Hunter residence was rather unusual behind the front door. The reception rooms would have been normal enough for a wealthy family home, but the back of the house had been converted into an extraordinary museum for Hunter's collection of anatomical samples in rows and rows of jars, plus other natural oddities such as a stuffed giraffe and a whale skull.

The collection was designed to be seen, though strictly by invitation only. For the most part it comprised Hunter's own preparations – objects exciting an anatomist's interest, in cases and jars, preparations vital to his teaching work (just as such preparations and dissections remain vital to the teaching of anatomy today). But this collection had a dual role: it was partly a showcase for Hunter's research and a tool for his teaching work, but it was also a cabinet of curiosities. There was the double skull of the "two-headed boy of Bengal" for instance – a seven-year-old with a parasitic head attached to his own, exhibited by his parents and seen by some official of the East India Company. When he died he was shipped to Hunter, and into the collection he went – his skull(s) remains there to this day.

When Hunter bought the house in Leicester Square he also bought the house that backed onto it at 13 Castle Street. He built a sort of bridge between their facing back walls, extending his house to a suite of rooms that once belonged to the back of the Castle Street property. This area beyond the museum accommodated Hunter's students, and had a lecture theatre in which he could demonstrate experiments and dissections, plus a grandly named "*conversazione* room".

From this area, a door led to the very back and the dissection room. This is where the bodies were delivered, to be poked and sliced and generally taken apart in a good cause. One of Hunter's students, James Williams, described his Castle Street quarters thus: "In point of situation it is not the most pleasant in the world," he wrote. "The Dissecting Room with half a dozen dead bodies in it is immediately above and that in which Mr Hunter makes preparations is the next adjoining to it, so that you may conceive it to be a little perfumed…" Hunter performed his surgery at Hyde Park Corner at St George's Hospital, but it was here, in dingy Castle Street, that the real experimental work was done.

Vicious-looking tools like these were used by Georgian surgeons such as John Hunter

The place in society of a man such as John Hunter was rich in contradictions. As a surgeon he treated some of the prominent men of his age – men such as Adam Smith and David Hume (who called him "the greatest anatomist in Europe"), William Hickey, Gainsborough, the baby Byron and possibly James Boswell, too. Many of these and other celebrities – Joseph Banks, Joshua Reynolds and Daniel Solander – were personal friends of his and Anne's, highly respected members of civilised society.

## Shady practices

At the same time, developing Hunter's skills depended on somewhat shady practices including grave-robbing – not only illegal but also, well, rather distasteful. Yet how else could he be expected to conduct experiments that required real bodies? As a staff surgeon at St George's Hospital he was entitled to a small quota of cadavers, but not nearly enough for his purposes. And though in time the Anatomy Act would increase the supply by providing access to workhouse bodies for dissection, that wouldn't come into force until half a century later.

In a world before anaesthetics even the smallest procedure was **a horror of pain and possible infection**

"The country needed skilled surgeons, especially for the wars," explains Wendy Moore, author of *The Knife Man*, a biography of Hunter, "and a surgeon had to learn somewhere about the human body. It was convenient for them to practise on bodies, as long as they weren't the bodies of the wealthy – so long as it wasn't their relatives."

Part of the problem was, of course, that it was hard to persuade the living to take part in experimental work; in a world before anaesthetics even the smallest procedure was a horror of pain and possible infection, never undertaken unless absolutely necessary. This inconvenience (the small matter of practically intolerable pain) didn't stop Hunter from experimenting on his patients, whether they agreed to the procedure or not. As a surgical zealot, Hunter seems to have had trouble understanding why others might not want to expose themselves to a little scalpel-work.

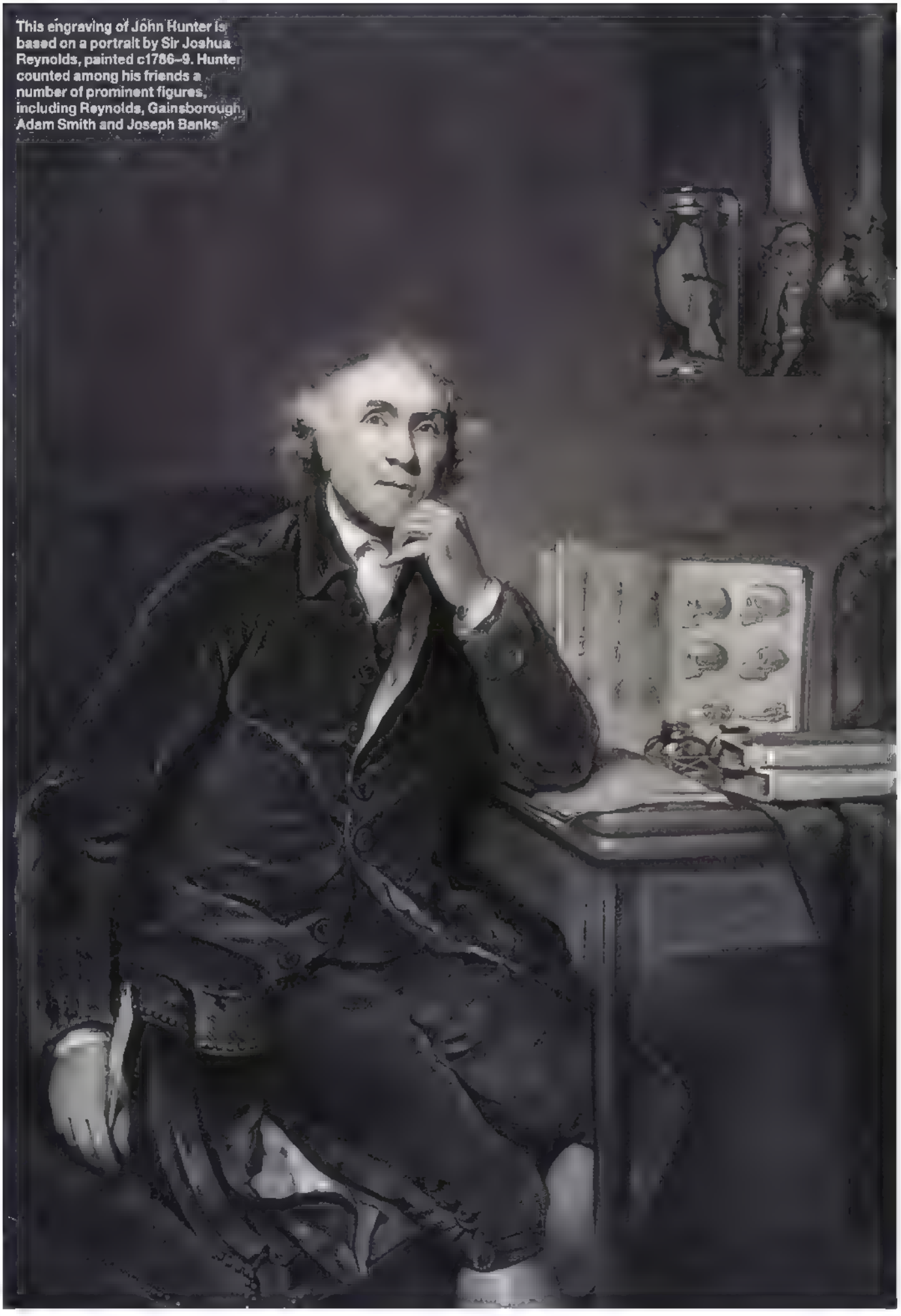
To give him credit, Hunter was prepared to use his own body for experimentation when no other was available. One of his case studies concerns a male patient whom he infected with gonorrhoea; though there is no name on the case history, the victim may have been Hunter himself, an eager martyr to the cause of medical advancement.

For a man with such zeal it's perhaps surprising that Hunter was such a reluctant surgeon. He believed that his work was not simply to cut up patients willy-nilly, but to assess their condition and ascertain when to operate and when – in preference – to leave the patient alone. "Operations should never be introduced but in cases of absolute necessity," he wrote. With such attendant risks, his caution seems entirely reasonable.

It's no wonder that those who underwent procedures under Mr Hunter's knives – and survived to see the dawn – felt heroic. You can't help admiring the man who had a tumour weighing 144 ounces (4kg) cut away from his neck (see overleaf). And think also of those brave men who agreed to undergo a lithotomy – a particularly painful operation for removing bladder-stones either with an incision-and-forceps procedure or by inserting a nasty-looking instrument up the urethra to break the stone up.

These courageous patients decided, presumably, that a few minutes of unspeakable agony were preferable to a lifetime of untreated discomfort; it's hard to blame those who decided that they'd rather like to keep the miserable object extracted, as a souvenir – a sign of their fortitude. The museum at the Royal College of Surgeons today has quite a collection of bladder-stones, some of them

SCIENCE AND SOCIETY PICTURE LIBRARY



This engraving of John Hunter is based on a portrait by Sir Joshua Reynolds, painted c1786–9. Hunter counted among his friends a number of prominent figures, including Reynolds, Gainsborough, Adam Smith and Joseph Banks

GETTY IMAGES

An illustration based on William Hogarth's 1751 engraving *The Reward of Cruelty* shows a murderer's cadaver being dissected. Surgeons such as Hunter experimented on executed criminals and grave-robbed corpses as insufficient bodies were available from hospitals

BRIDGEMAN

extracted from famous bladders; one of them even has its own elegant display case, just the right size for slipping into a waistcoat pocket to be pulled out to impress people at parties, engraved "Extracted November ye 4th 1725". Its owner must have been very proud.

Grave-robbing was unsavoury, and even Hunter the society man couldn't quite legitimise it, though of course blind eyes were turned. But at least on his watch the post-mortem examination did for the first time become fairly respectable, and its value recognised. Taking public awareness to an extreme, Samuel Johnson's autopsy was even published in detail in the newspapers.

"Hunter effectively legitimised post-mortems," says Moore, "and tried to explain the need for them. From about the middle of the 18th century it began to be realised that you could learn from a dead body, and that's when some families were starting to be persuaded that they should allow post-mortems." Hunter even conducted post-mortems on a number of his friends, apparently without any trace of sentiment.

## Snatched bodies and freaks

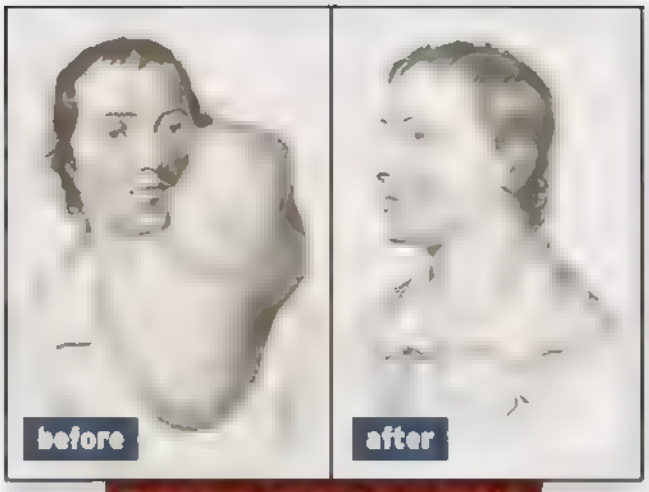
What of Hunters collection – a motley assortment of cuttings from snatched bodies, famous patients, animals and human freaks? Without a doubt the most celebrated of all Hunter's exhibits was Charles Byrne, 'The Irish Giant'. Standing at just over or just under 2.4 metres (8 feet) tall, depending on which report you believe, this was a body John Hunter very much wanted to get his hands on. Byrne refused all Hunter's offers to make himself available post-mortem, but when the giant died in 1783 Hunter simply bought the body anyway, outbidding the man whom Byrne had charged to dispose of his remains in a more dignified way.

It was from such bodies, and other similar acquisitions – executed criminals and animal carcases from the royal menagerie, for instance – that Hunter was able to conduct his experiments on dentition, reproductive and digestive systems, and so on, and from there to assemble the preparations that now form the bulk of his collection.

There was always an element of spectacle to Hunter's collection; in part it was put together to impress, and the display in Leicester Square was designed to its best advantage. The same goes for the collection today. At Hunter's death, his collection was offered for sale to the Pitt government, who pressed for funds as always – turned it down. It was only six years later, in 1799, that the necessary £15,000 was found and the collection the most extensive and significant collection of physiological specimens in England, row after row of them – passed into public hands and the care of the College of Surgeons. The collection formed the basis for a museum constructed at a site in Lincoln's Inn Fields. The Museum of the Royal College of Surgeons was formally opened in 1813, and an extensively renovated Hunterian Museum created in 2005.

The stars of the show are still the same, of course: Byrne is still there, and the shelves and shelves with jars and jars containing all manner of anatomical features – the double-skull of the two-headed boy of Bengal is here, too, the nasty-looking instruments, the proudly preserved bladder-stones and all. For Simon Chaplin, former senior curator of the museum, the display-cased bladder-stone is particularly revealing for what it tells us about the way the museum itself has changed. "Before [the new museum], things like that didn't have a place, because they didn't fit into a grand scheme of classification," he says. "I'm quite surprised no one had taken it out of the box, thrown away the box and displayed it with all the other bladder-stones."

In the Hunterian Museum, both of the collection's original roles are fulfilled. The displays are used to explain, while keeping that special element of spectacle and wonder. "If we end up with only a medical audience, or with medical visitors forming too high a proportion of our visitors, then we won't have succeeded," Chaplin commented at the opening of the new museum in 2005. For the medically trained, it retains the educational purpose that was so important to Hunter. For the rest of us, it's also a cabinet of curiosities. Go and goggle at these strange, strange things; look with awe, as unscientifically as you like. There's no need to be embarrassed – John Hunter would have understood. ■




## From the doctor's casebook

John Burley, a Rigger, thirty-seven years of age, of a middle size, dark complexion and healthy constitution; about sixteen years ago, fell down, & bruised his cheek on the left side, above the parotid gland. It was attended with a good deal of pain, which in four or five weeks went off, and the part began to swell gradually, and continued increasing for four or five years, attended but with little pain.

At this time it was increased to the size of a common head, attended with no other inconvenience than its size and weight. He again fell, and received a wound on the side, which gave considerable pain at first, but it got well in eight or nine weeks. After this, the tumour increased without pain, on the lower part; as also at the basis, extending itself under the Chin to the amazing size it now appears. Lately ... he says he can perceive it bigger every month.

The tumour is in parts the colour of the Skin, in other parts of a shining purple. The beard grows upon it, and is shaved in common ... It is hard to the feel some places; and in others softer, as if containing a fluid.

The Operation was performed on Monday October the 24th, 1785. It lasted twenty-five minutes, and the man did not cry out during the whole of the operation. The Tumour weighed 144 ounces.

**Grave-robbing was unsavoury** – even Hunter the society man couldn't legitimise it

**Daniel Hahn** is a writer and editor whose books include *The Tower Menagerie* (Simon and Schuster, 2003)

### DISCOVER MORE

**BOOK**

▶ **The Knife Man** by Wendy Moore (Bantam Press, 2005)

**MUSEUM**

▶ The **Hunterian Museum**, Royal College of Surgeons of England, 35–43 Lincoln's Inn Fields, London *rcseng.ac.uk/museums-and-archives/hunterian-museum*. The museum closes on 20 May for a three-year renovation project

WELLCOME IMAGES

# MEDIEVAL

# HOSPITALS

Today, hospitals bustle with clinicians and nurses tending to the sick and injured. But as **Sheila Sweetinburgh** reveals, medieval hospitals were very different establishments where you might pay for your care and board with a prayer - or hard cash

Two afflicted men at a leper house in an illustration from a 14th-century French manuscript. Many leper hospitals were founded in England after the Norman conquest

A 13th-century doctor and patient. Few medieval hospitals had a doctor or a surgeon

In the early 14th century numerous hospitals were pleading poverty. **Some were wiped out by the Black Death**

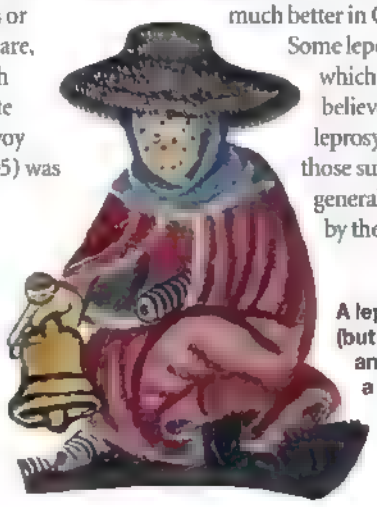
There were, broadly, four types of hospital in the Middle Ages: for lepers; for poor (and sick) pilgrims; for the poor and infirm; and almshouses or bedehouses. This last form of hospital was often subject to the explicit instruction that the brothers and sisters (those who resided there as long-term inmates) should pray daily for the souls of the house's founders and benefactors – 'bede' being the Middle English for 'prayer'.

Poor pilgrims often just stayed overnight at a hospital. Though some medieval hospitals took in the sick, others seem to have cared only for the old and infirm. Indeed, professional medical care by physicians or doctors seems to have been rare. There are, though, a few references relating to such provision at London hospitals in the late Middles Ages; in 1524, for example, Savoy Hospital (founded by Henry VII in 1505) was expected to have a doctor and surgeon.

We probably know more about the founders of the 850-plus medieval hospitals and almshouses in England than we do about their long-term resident brothers and sisters, and we know almost nothing about the people who were cared for in hospitals. These shadowy figures can be glimpsed only indirectly – through, for example, the provision at St Thomas's Hospital in Canterbury whereby sick pilgrims could stay for more than the typical one night. If they did not recover but instead died there, they would be buried in Canterbury Cathedral's lay cemetery. Not far away, at St John's Hospital, Sandwich, the sick poor and women in labour could stay in the three rooms at the back of the hospital, which included the "chamber for strange women" – women who were strangers in Sandwich.

Hospitals were not spread evenly across England. The medieval equivalent of today's 'postcode lottery' meant, for example, that provision was sparse in Worcestershire but much better in Gloucestershire.

Some leper hospitals, which housed those believed to have leprosy, also took in those suffering from general infirmity, and by the later Middle Ages many of these no longer housed any lepers at all, instead taking in the old and infirm. Additionally, most hospitals housed no more than 20 brothers and sisters – 12 being the most common number – along with a priest. St Leonard's Hospital in York was truly exceptional, having around 225 beds.



A leper with a bell (but missing a hand and a foot) in a 15th-century manuscript

The decision as to who entered the hospital generally rested with the patron, and some prospective entrants sought help from influential backers who might also provide the entrance fee. But having a financial backer was not always enough. In the mid-14th century, as patron, the prior of Christchurch Priory, Canterbury, turned down Queen Philippa's request for her maidservant to join St James's Hospital near the city. Philippa's request was for a corrody (effectively a form of insurance, whereby a payment guaranteed the provision of food, clothing, care and accommodation at the hospital) so she was prepared to pay – perhaps just not enough.

Many hospitals frowned upon this practice, yet it seems to have been remarkably common. The going rate varied over time, and between and within hospitals. At St John's Hospital in Sandwich in the 15th century, most new brothers and sisters paid 6 shillings and 8 pence (though one Margery Warner paid with 1,000 tiles, perhaps floor tiles). At neighbouring St Bartholomew's in the early Tudor period, the fee to remain at the hospital for the remainder of the inmate's life might be as high as £19 (the equivalent of around £8,500 today). This sounds expensive, but the new brother or sister might pay in instalments and live for several decades at the hospital, expecting to receive board and lodging, clothing, shoes, fuel and other necessities, without further payment.

Early hospitals (of which probably the first to be founded after the Norman conquest was St John's Hospital, Canterbury) often provided separate dormitories for men and women, with an adjoining chapel that also segregated the sexes. This meant that the brothers and sisters could easily attend divine service, where they would recite specific

BRIDGEMAN

Almshouses on the site of St Thomas's Hospital, Sandwich, established in 1392 to house 12 'brothers' and 'sisters'

ALAMY

prayers – each inmate at St Andrew's Hospital at Hythe, Kent, daily recited 300 paternosters, Ave Marias and Credos for their benefactors.

Brothers and sisters hardly spent all day on their knees, though. We know that at some hospitals the brothers, in particular, worked on the home farm, while the sisters worked in the brew house and bake house, and presumably also tended the kitchen garden and any sick people at the hospital.

This communal lifestyle extended to the kitchen. At St Bartholomew's, Sandwich, it was stipulated that each person should daily put their piece of meat (or fish on Fridays, and during Advent and Lent) into the common cauldron of pottage, and then receive a share once it was cooked. The daily allowance of bread (a half-penny loaf – about 10 ounces, or 280g) and ale (about 1.75 pints of single ale) was supplemented by cheese and fruit, including apples. This was a much better diet than at some other hospitals, which largely depended on substandard produce that had been rejected by market officials.

Whether such hospitals were always able to deliver this level of provision is impossible to know for sure. Certainly in the early 14th century, in particular, numerous hospitals were pleading poverty and some were completely wiped out by the Black Death.

Corrupt hospital officials could also prove problematic, though hospitals whose patrons were located nearby generally appear to have experienced fewer problems. Disputes sometimes erupted, and discipline might involve corporal punishment, fines or expulsion. For example, Petronella Boys joined St John's in Sandwich following the death of her husband, who had been a brother there. Initially all was well but a decade later Petronella refused to follow the authorities' edicts and was expelled.

Nevertheless, compared with life elsewhere, a hospital would have been seen by many as commodious if not luxurious, offering a degree of security in a generally uncertain world.

**Sheila Sweetinburgh** is the author of *The Role of the Hospital in Medieval England: Gift giving and the Spiritual Economy* (Four Courts Press, 2004)

**BOOK**

▶ **The Medieval Hospital and Medical Practice**, edited by Barbara S Bowers (Routledge, 2017)

An illustration of a couple on a couch dated 1908 – a time when, for many people, the shame of syphilis outweighed the desire for a cure

MARY EVANS PICTURE LIBRARY

# Microbes, magic bullets and morality


SCIENCE PHOTO LIBRARY

Syphilis is a debilitating disease that can lead to madness and paralysis – yet, as **Jad Adams** explains, the discovery of a cure for this sexually transmitted infection a century ago sparked moral outrage in Britain

A century ago, debates about the scourge of syphilis plunged Britain into a heady battle of science, sex and politics.

A powerful strain in Victorian thinking considered syphilis a curse from God – a punishment for sinful acts. Respectable professionals felt that promoting a sense of shame about the disease was in the public interest. Syphilis was almost literally unmentionable – if referred to at all it was using euphemisms such as 'the social disease', emphasising not individual illness but a general malaise. Government health insurance, sick clubs and benefit societies refused to pay out to those with syphilis because it was a 'misconduct disease'. Inevitably, this resulted in concealment.

Shame about the disease contributed to the proliferation of quacks offering secretive quick fixes. These 'cures' were considered credible only because of the way the symptoms developed in three phases: first a painless sore on the initial site of infection; weeks later an overall rash or sometimes just a headache and general illness; then, one or more years after the initial infection, the appearance of gummata – rubbery balls of inflammation that led to the characteristic syphilitic disfigurement.

Syphilis could often be mistaken for some other illness, or it could be in a latent phase, or the symptoms could disappear of their own accord, leading to the assumption that the condition had been cured. It was not known until late in the 19th century that the madness and paralysis symptomatic of late neurosyphilis were caused by the disease. As concepts of eugenics gained ground at the end of the 19th century, syphilis inherited by the children of the infected increasingly became a cause for concern

Men could be induced to believe they had been cured by the excision of a painless sore, leaving them with nothing but a scar on the penis that they thought of like a duelling scar – a rite of passage. The disease was less evident in women, and they might not know that they had been infected.

Since the Middle Ages the treatment of choice for syphilis was mercury, leading to the saying: "A night with Venus, a lifetime with Mercury". Mercury had some effect in relieving symptoms but was by no means a cure, and caused its own unpleasant side effects.

Fear of syphilis was used to discourage sexual activity. A senior doctor in the 19th century called the disease a "restraint upon the indulgence of evil passions". Moralists would warn: "The girls who form the class from which the occasional prostitute is recruited, as well as the careless pleasure-seeking girls who frequent public houses and places of amusement, should know that one fall, the result of excitement or too much drink, may bring not only loss of character but loathsome disease."

## Fictions of syphilis

Adding to the debate about syphilis were potent didactic fictions. Sarah Grand's 1890s novels *The Heavenly Twins* and *The Beth Book*, featuring syphilitic men and helpless women, used the disease as a critique of marriage and class attitudes. Ibsen's tremendously influential *Ghosts*, about syphilis in a family, became widely known as a text but for many years was not performed in London due to theatre censorship, except for one private performance in 1891. The play's hero, Oswald Alving, does not know that he contracted the disease from a parent; instead thinking that his own behaviour caused his syphilis because his mother has deceived him about the nobility and sanctity of his father. It was markedly shocking to audiences that Mrs Alving's evident respectability did nothing to protect her loved ones. *The Daily Telegraph*'s theatre critic called the play "an open drain, a loathsome sore unbandaged; a dirty act done publicly". In the French play *Damaged Goods* (1901) by Eugène Brieux, which was presented in England by George Bernard Shaw, a small-town doctor faces a dilemma when he treats a man with syphilis. The man intends to marry to collect a dowry. Should the doctor warn the bride to be? He does not, and she gives birth to an infected baby. Initially deemed inappropriate, the play was staged in private performances in the US in 1913 and in London the following year.

Illustrations from a c1850–60 medical book depict examples of syphilitic disfigurement

## Germ theory

At the beginning of the 20th century the work of scientists developing the microbial theory of disease mitigated such scaremongering. Improved understanding of syphilis was a key element in the development of germ theory because it was so widespread, and because the causative organism was large by microscopic standards. It was first seen in 1905 when a 25-year-old woman from Berlin, complaining of skin lesions and headaches, consulted Erich Hoffmann. He found a genital sore, excised the papule and sent a sample to a colleague, Fritz Schaudinn. Under the microscope Schaudinn found corkscrew-shaped organisms called spirochaetes. The researchers examined other syphilitic patients and discovered 11 cases of infection with these micro-organisms, naming them *Treponema pallidum*.

A blood test for the organism was developed by August von Wassermann in 1906. A Russian scientist, Ilya Mechnikov, and his French colleague Pierre Roux made the first step towards treatment at the Pasteur Institute when they showed that the highly mobile but fragile bacterium can be made inactive with the application of calomel ointment within a few hours of infection.

Meanwhile, German researcher Paul Ehrlich had been working on selectively staining tissues for examination. Ehrlich, the head of a research institute in Frankfurt am Main, was the prototype of the mad scientist of popular fiction; his colleagues called him 'Dr Phantastes' because of his weird ideas and idiosyncratic lifestyle. He spoke in a mixture of Latin and German, his study and laboratory were a chaos of coloured dyes, scientific papers and intricate diagrams, and he could never remember anything but his work.

Ehrlich developed the use of dyes to stain specific organisms for microscopic study, leaving the surrounding tissue unaffected. He then had the idea to look for other similarly selective compounds, not to stain but to destroy only a single organism. "We must learn to shoot microbes with magic bullets," he said, and gave his new theory the name chemo-therapy.

A Japanese scientist, Sahachiro Hata, joined Ehrlich's laboratory in 1909. Ehrlich charged him with testing modifications of an arsenic compound against the spirochaetes

BRIDGEMAN

that Hoffmann had discovered. The 606th variation that he tested destroyed the spirochaete in rabbits. Ehrlich refined it and tested it under the name Salvarsan, announcing the discovery at a congress for internal medicine at Wiesbaden in April 1910.

Salvarsan was in active clinical use by the following year. It had to be introduced by intramuscular injection and did not dissolve easily; however, further refinements produced neo-Salvarsan, which could be used intravenously.

Yet the widespread use of a cure for this devastating disease was bitterly opposed in Britain by both the church and radical feminists who argued that lifestyles, not medicine, must adapt to defeat syphilis. An old-style Victorian morality was joined in the new century by a feminist critique that blamed every ill on the rapacious sexuality of men. Their notions of women were constrained by outmoded ideas of 'purity' in which women had no apparent sexuality of their own.

Louisa Martindale of the constitutional National Union of Women's Suffrage Societies, in her text *Under the Surface*, connected prostitution and sexually transmitted infections (STIs) with the denial of the vote. In 1913, Christabel Pankhurst's *The Great Scourge and How to End It* claimed that up to 80 per cent of all men had an STI, warned against "moral degeneracy and race suicide" and proposed a solution neatly encapsulated in a slogan: "Votes for Women and Chastity for Men". She argued: "men are constantly infecting and reinfecting the race with vile disease, and so bringing about the downfall of the nation!" Of Salvarsan she said: "men are speaking of this supposed remedy as though its discovery were a licence to them to go and sin in safety." She reassured her followers that nature "willed that there should be no way of escape from this scourge except one, and that one the way of purity".

## Shame about the disease contributed to **the proliferation of quacks offering quick fixes**

### The double standard

The Contagious Diseases (CD) Acts of 1864, 1866 and 1869 aimed to reduce sexually transmitted infections in the army and navy by apprehending and forcibly examining prostitutes in 'protected districts' near naval camps and army bases. Women suspected of being prostitutes were subject to compulsory inspections and could be detained for treatment (which was not particularly effective) for up to three months.

The laws were part of a paternalistic view of society – done for the public good, along with the Factory Acts, clean water supplies and vaccination against smallpox. Yet the lawmakers were not counting on the reaction of newly educated women, who resented the double standard. After all, women were subject to compulsory treatment – but men were not. The CD Acts spawned the first effective political campaigning movement led by women, under Josephine Butler, leader of the Ladies' National Association.

The campaign was not universally acclaimed by progressive individuals. For example, it did not attract the support of Elizabeth Garrett Anderson, Britain's first female doctor, who felt that the CD Acts – though defective – were better than nothing as a measure to combat such diseases. The acts were suspended in 1883 then finally repealed in 1886.

## Evil in society

With the advent of realism in literature and the 'New Woman' critique of society, syphilis could now be discussed – but the discussion tended to use the degenerative progress of the disease as a metaphor for evil in society. It was felt that syphilis was undermining the family, the army – the entire race – at a time when no strict distinction was made between inherited defects and congenital illness.

The delay in making treatment widely available was damaging Britain's military strength in the prewar years of European rivalry. In 1907, after Mechnikov had demonstrated that calomel could kill the syphilis organism on the skin, the German navy adopted prophylactic kits based on his discovery to distribute to sailors. Two years later, while the British authorities still thought in terms of shame and self-control, the Austrian army did the same. In 1909 Henry Robson, a Bournemouth GP and former ship's doctor, wrote *Social Disease and its Prevention*, including a description of Mechnikov's method. He was threatened with being struck off the medical register, and libraries and booksellers refused to stock the work.

The logjam of social restraint was broken only on 22 January 1913 when a letter signed by leaders of the medical profession called for the appointment of a royal commission and denounced a "conspiracy of silence" about STIs.

A royal commission was duly appointed in 1913. Fortunately for those who wanted effective action, the First World War led to unprecedented levels of STIs at a time when able-bodied men were needed as never before. It was also feared that women were flinging themselves at the new recruits. "The wave of patriotic feeling and general excitement that passed like a flame over the land during the first months of the war did result in a dangerous heightening of sexual passion," wrote Dr Mary Scharlieb, a member of the commission.

Reporting in 1916, the commission recommended better facilities for laboratory diagnosis using the Wassermann test, the organisation of treatment centres by local councils, and the provision of Salvarsan without charge. They would not support Mechnikov's ointment treatment, however, as prophylaxis might encourage sexual activity. "The offer to make unchastity safe was a blow at the nation's morals," said Scharlieb.

Paul Ehrlich and Ilya Mechnikov shared the Nobel Prize for their work on immunity. Ehrlich, worn out by overwork and attacks from attention seekers and moralists, died of a stroke in 1915. Salvarsan was used until 1945, when it was superseded by penicillin. ■

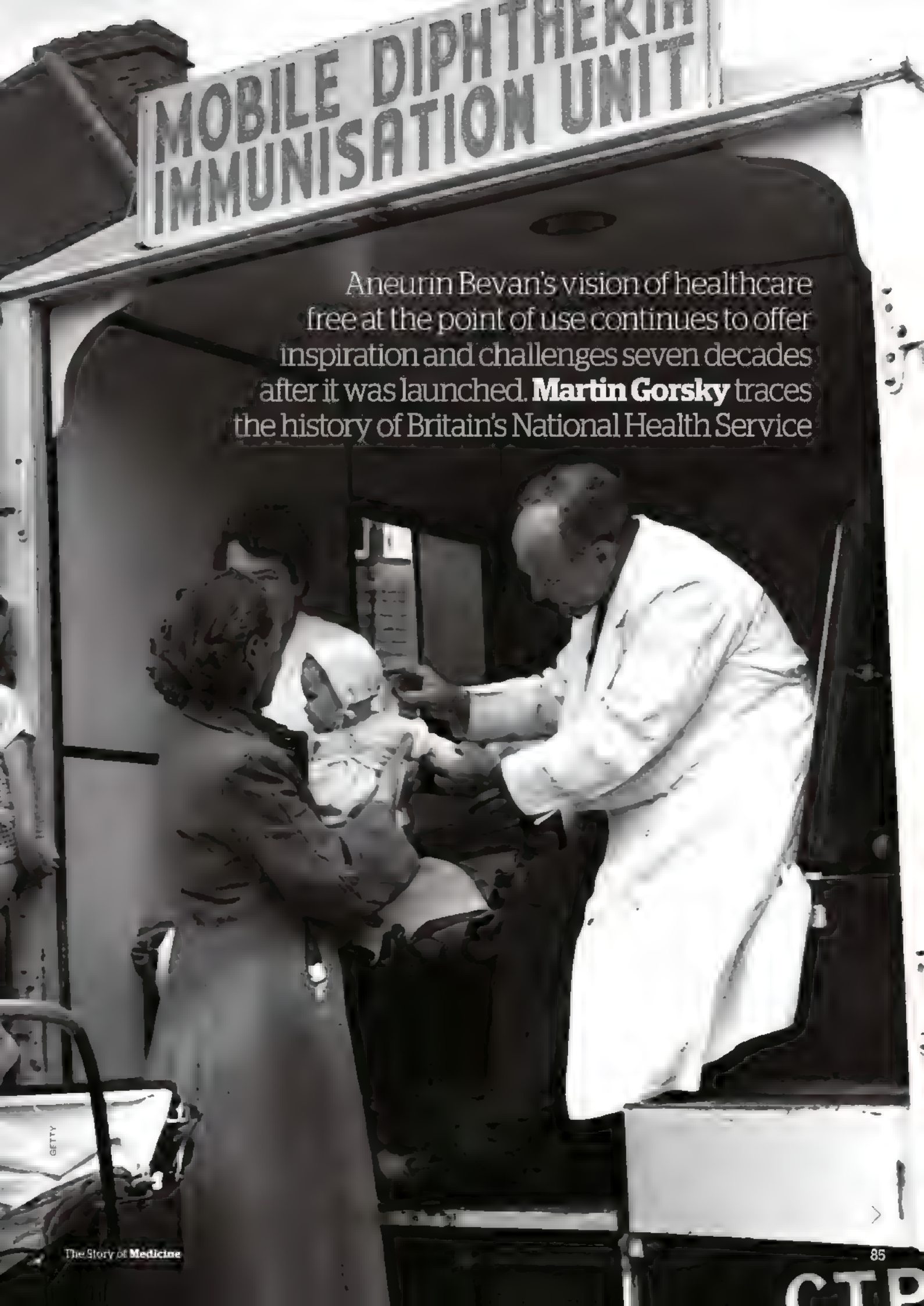
**Jad Adams** is a historian, broadcaster and writer, author of *Women and the Vote: a World History (Oxford University Press, 2014)*

**BOOKS**

▶ **Pox: Genius, Madness and the Mysteries of Syphilis** by Deborah Hayden (Basic Books, 2003)

# NHS: Britain's *healthcare revolution*

Mothers queue with their children at a mobile immunisation unit in Portsmouth in 1951. Such NHS initiatives helped reduce infant mortality




Aneurin Bevan's vision of healthcare free at the point of use continues to offer inspiration and challenges seven decades after it was launched. **Martin Gorsky** traces the history of Britain's National Health Service

GETTY

Most of us will suffer some creaking joints by the time we turn 70. So it is with the British National Health Service (NHS), which will celebrate that momentous birthday in 2018, seven decades after its launch on 5 July 1948. That the NHS remains a much loved national institution was clear to the whole world when it starred in the opening ceremony of the London 2012 Summer Olympics.

In contrast with such celebrations, though, the NHS often makes the news for all the wrong reasons. Headlines tell of desperate funding shortages, angry junior doctors and hospital wards strained to bursting. Debate also rages over whether Britain's tax-funded NHS model is fit for the future, as the country's disproportionately aged population needs ever more care.

Can we really keep to the promise with which Aneurin Bevan launched the NHS – of a universal, comprehensive service, free at the point of use? As we reflect on these questions, it's helpful to remind ourselves why Britain created the NHS in the first place, and to ask how well it has coped.

The origins of the NHS are something of a historical puzzle, because in the early 20th century the British could already claim to have a successful, popular health system. As chancellor of the exchequer, in 1911 David Lloyd George set up a system of National Health Insurance (NHI) to cover sickness benefit and care by general practitioners (GPs) for the waged working class. There were world-renowned 'voluntary' hospitals (so called because of their philanthropic origins), where cutting-edge acute care was delivered. Local government provided general hospitals, a school medical service and public health facilities. For older patients with long-term illnesses, Poor Law institutions offered social care. Hospital charity was a popular part of community life, and public opinion polls suggested that people were broadly satisfied.

So what went wrong with this diverse, localist approach? The problems lay with gaps, patchiness and unfairness. Only about half of the population was covered by NHI, meaning that children, homemakers and older people lost out, as did the less-prosperous middle class. There were means-tested charges for voluntary hospitals, and another insurance layer of 'contributory schemes'. GPs tended to devote more time to their paying customers, which upset their NHI patients. Despite modernisation, the Poor Law had not shed its Dickensian image and people still felt the humiliation of entering the 'workhouse'.

**Aneurin Bevan, minister of health in the postwar Labour government, who launched the NHS in 1948**

Because there was reliance on charity and variable local taxation, service levels were uneven. And as economic depression started to bite in the 1930s, these failings were reflected in high maternal mortality, weak and malnourished children, and significant discrepancies in life expectation between rich and poor.

However, it took the shock of 'total war' against Germany from 1939 to turn the complaints into momentum for change. In anticipation of heavy casualties, an Emergency Medical Service was launched, with central government coordinating the whole system. Here was a model for what a properly integrated NHS could look like. In 1942, at a low point in the war, the Beveridge Report was published. Though commissioned by the government, this was no dry official document. Instead, its blueprint for a postwar welfare state quickly became a bestseller, and its promise of a better future inspired the war-weary public.

As the fighting wound to a close, Britain's coalition government struggled to devise a structure that would satisfy the various bickering interest groups. These included the British Medical Association, whose members dreaded becoming public employees; council leaders, who favoured a local-government-based NHS; and top hospital clinicians, worried about losing power.

As economic depression started to bite in the 1930s, **healthcare failings were reflected** in high maternal mortality

The 1945 election, in which Labour swept to office, broke the stalemate. The new minister of health was Aneurin 'Nye' Bevan, a popular politician from the Welsh valleys with roots in trade unionism. Bevan was decisive. A universal NHS would be launched, funded by progressive general taxation, with no up-front charges. Services would be comprehensive, meeting people's needs "from cradle to grave". Hospitals would all be 'nationalised' and grouped under new NHS boards rather than local government. GPs would remain self-employed, but would be contracted for NHS work. Hospital doctors would become salaried employees, but handsomely paid and permitted to treat private patients.

None of this was perfect, largely because of the compromises Bevan had made in order to push through the legislation. Socialists hated the retention of private medicine in the proposals, and many mourned the removal from local government of all but limited public-health powers. Where now were democracy and the patient's voice?

The new structure also set in stone the barrier between health (the NHS) and social care (local government) – which would soon lead to trouble. Indeed, the difficulties it created in providing 'joined-up' care to older people with complex needs are still with us. The first complaints that long-stay patients were 'bed-blocking' because of gaps in community care were not long in coming. Bevan had envisaged a network of new health centres that would link up preventive public health with accessible, team-based primary care. However, such a network was never created, because of postwar shortages and doctors' determination to remain independent practitioners.

## Evolution and innovation

How has the NHS changed since then? Improvements were slow during the 1950s as 'austerity Britain' rebuilt after the war. However, public opinion quickly got behind the service, and professional morale was high as doctors strove to make the new system work. Unmet needs were addressed, though such was the call for drugs, spectacles and dental care that prescription charges were introduced to deter inessential use.

By the 1960s the post-war recovery was underway, and the NHS began to develop. A hospital rebuilding programme was launched, along with investment in 'family practice' to modernise GP surgeries. Slowly, grim Poor Law institutions and Victorian lunatic asylums began to be replaced with community facilities. Under Labour governments in the 1970s successful efforts

GETTY


Second World War. Before that time only half of the British population was covered by National Health Insurance – and children often lost out

GETTY

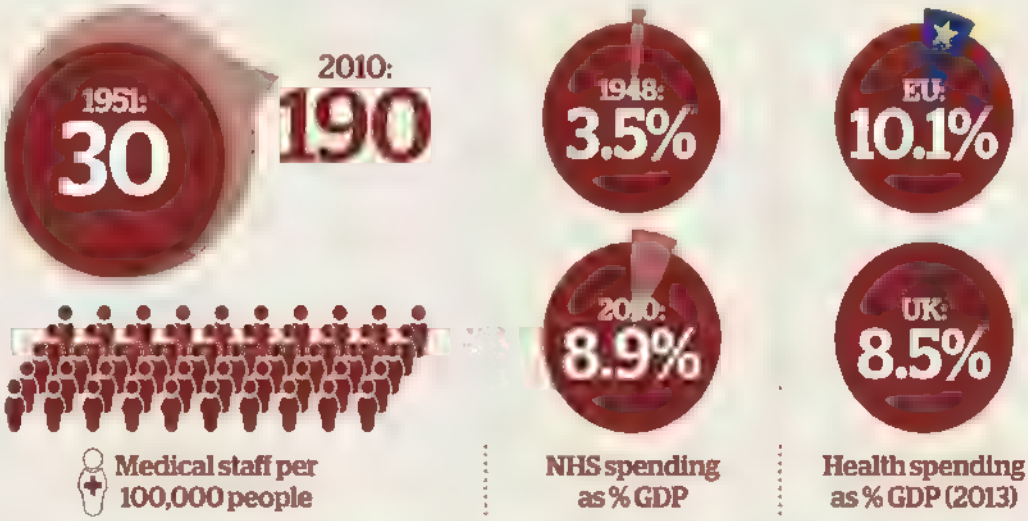
# British health in numbers

Figures show how British health and investment have changed since 1948

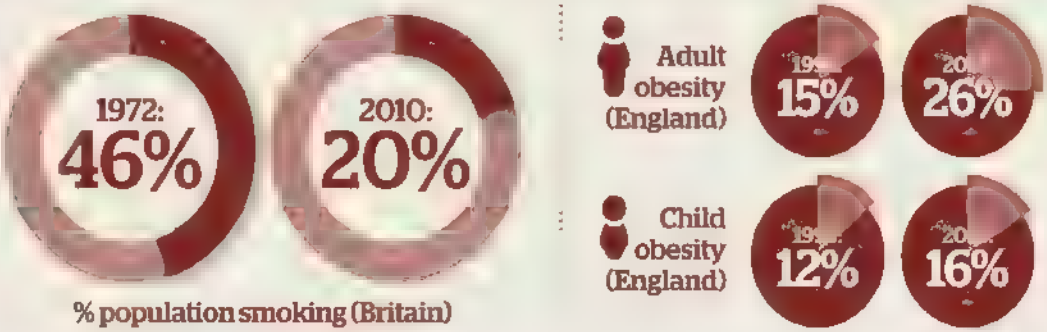
Since the foundation of the NHS in 1948, the health of the British people has improved. Average life expectancy has risen and many more people live on into their eighties and beyond. Deaths in childbirth and infancy, from infectious, respiratory and diarrhoeal diseases, have also largely become a thing of the past. But do longer lives always mean better health?


Unfortunately not. Illness and disability becomes more common in later life, and the number of years older people can enjoy free from sickness is actually going down. Cancers, heart disease, musculo-skeletal troubles and poor mental health are just some of the problems we face.


This puts huge pressure on the NHS, which today is far bigger in terms of staff and patients than when it was launched. It is also much costlier, consuming over 8 per cent of our national wealth – and yet we trail behind the European average.




Is there an alternative to this ever-rising burden on the NHS? Our best chance of minimising sickness in old age is to try to live healthier lives. Big strides have been made in reducing smoking rates, though our love for sugary and fatty foods means that obesity is on the rise.




FIGURES ARE AVERAGES OF MALE AND FEMALE FOR UK HEALTHY LIFE EXPECTANCY AT AGE 65. ADULT OBESITY (ENGLAND); CHILD OBESITY (ENGLAND); SOURCES: HUMAN MORTALITY DATABASE. UNIVERSITY OF CA., FORN A, BERKELEY (USA), AND MAX PLANCK INSTITUTE FOR DEMOGRAPHIC RESEARCH (GERMANY) AT WWW.MORTALITY.ORG; OFFICE OF HEALTH ECONOMICS, THE GUIDE TO UK HEALTH AND HEALTH CARE STATISTICS SECOND EDITION, EMMA HAWE AND LESLEY COCKCROFT 2013, PP 25, 27, 45, 84; BRITISH HEART FOUNDATION, CORONARY HEART DISEASE STATISTICS A COMPENDIUM OF HEALTH STATISTICS 2012 EDITION, PP 110-111, 186, 188; JOHN APPLEBY HOW DOES NHS SPENDING COMPARE WITH HEALTH SPENDING INTERNATIONALLY? KINGS FUND BLOG 20 JANUARY 2016 HTTPS://WWW.KINGSFUND.ORG.UK/BLOG/2016/01/HOW-DOES-NHS-SPENDING-COMPARE-HEALTH-SPENDING-INTERNATIONALLY


Nurses march in Newcastle in 1974 during a nationwide dispute over wages

were made to improve fairness in the way health spending was distributed, both geographically and across the different programmes, so that the 'Cinderella (neglected) services' of geriatric care and mental health received a larger slice. However, storm clouds were gathering as economic turbulence brought the golden age of welfare state expansion to an end.

After 1979, Margaret Thatcher's Conservative governments signalled a new direction for the NHS. Funding would be squeezed to alleviate the tax burden on the rest of the economy, so better ways were needed to get value for money in health. Much thought was given to whether a new financing model, based on insurance rather than tax, should be adopted. However, the Conservatives concluded that this would be more costly and unpopular. Instead, their approach in the 1980s was to import private-sector management techniques, making hospitals more businesslike in controlling their costs.

## Big bang

The 1990s saw a 'big bang' reform: the 'internal market' The basic idea was that GPs would progressively become 'fundhold ers' of the health budget, and would 'purchase' services from 'providers' – the hospitals. This was unlike the Bevan model, in which money was shared out from above according to designated spending in the different parts of the NHS. The new model would involve more competition within the state system, with the aim of encouraging efficiency and quality.

Tony Blair's 'New Labour' government, elected in 1997, reversed this policy but then reinstated it in the 2000s, though commercial overtones were softened – 'purchasing' was rebranded as 'commissioning'. The creation of the National Institute for Clinical Excellence (NICE) to assess the cost-effectiveness of new treatments was another important step, though its judgments sometimes annoyed interest groups and big pharma. The Blair years also saw the funding tap reopened, with NHS spending rising to European levels. By the eve of the financial crash in 2008, key indicators such as falling waiting times and rising public satisfaction suggested that the NHS was in rude good health.

How can the performance of the NHS since 1948 be assessed? One way is to compare Britain's health system with those of its peers such as France and Germany, which use social-health insurance, or with the US, which mixes state funding and private insurance. Such comparisons show that the NHS is distinctly cheaper, whether spending is measured per person or as a proportion of our GDP.

Comparing Britain's health system with those of its peers such as France and Germany, **the NHS is distinctly cheaper**

On the one hand, there are advantages to government holding the purse strings. There are fewer pressures from doctors or insurance companies to ramp up prices and, as we have seen, British civil servants have devised many smart ways to deliver services with maximum efficiency. On the other hand, the state's power to set the total budget can lead to underinvestment, particularly at times when economic policy dictates lower public spending. Again, international experience shows that Britain has regularly suffered from this problem, falling behind other countries in areas such as cancer survival rates.

We should keep in mind the sobering fact that public satisfaction with the NHS is closely linked to spending levels. The NHS has served the British well for decades, giving us the security of knowing that money is no barrier to decent healthcare. Despite all its troubles, international comparison with other health systems suggests that switching to insurance or private medicine would offer no panacea. But history also tells us that the NHS works best only when funding increases keep pace with needs. For all their talk about efficiency savings, if we are to keep alive the high ideals on which the NHS was founded, politicians need to level with the public about this. ■

**Martin Gorsky** is professor in the history of public health at London School of Hygiene and Tropical Medicine

ALAMY

# BREAK & PIO

- **7 (more) surprising facts about the history of medicine**
- **Eye opener: Master Class**
- **Penicillin: when mould made medical history**
- **Pioneer: William Harvey**
- **Marie Curie: mother of radiotherapy**
- **Medicine's big bang**
- **Pioneer: Edward Jenner**
  The country physician who developed an effective smallpox vaccine
- **First World War: a medical milestone?**
  How conflict sparked advances in prosthetics and plastic surgery

# THROUGHS
# NEERS

# 7 MORE SURPRISING FACTS ABOUT THE HISTORY OF MEDICINE

From ancient enemas to tapeworm doctors, **Caroline Rance** shares seven more remarkable aspects of medicine's unpredictable, shocking and frequently gory history

This skull from Jericho, dating from c2000 BC, bears four trepanning holes

## 1 Prehistoric people needed surgery like a hole in the head

In 1865, American archaeologist Ephraim George Squier left Cuzco, Peru in possession of an old skull given to him by a collector. The artefact ignited debate in medical circles on both sides of the Atlantic.

Dating from around AD 1400–1530, the skull had a rectangular hole in its frontal lobe. Squier shared the find with the New York Academy of Medicine, and with French neuroscientist Paul Broca, who showed that the hole had been deliberately made while the person was still alive.

Examples of trepanning have since been found worldwide, dating back as far as 10,000 BC. The practice appears to have developed independently in many cultures, and using various methods: in some examples the skull was scraped with a sharp flint; in others a circle of holes was bored and the resulting disc prised out; and in some a 'hashtag' shape of grooves was created and the middle removed.

But what was its purpose? Broca speculated that ancient people believed it provided a route for evil spirits to escape from the body. It's a theory that remains popular today, but we should be aware that it rather suited white 19th-century anthropologists to view indigenous cultures as scientifically inferior.

It's also plausible that trepanning was a practical way to treat fractures; the ancient Greeks certainly used it for that purpose. With head wounds a familiar consequence of conflict or accident, practitioners might have observed the course of infection and realised that dead bone would eventually disintegrate (if the patient didn't die in the meantime), so removing fragments manually can be beneficial. We can't ask ancient communities why they made holes in heads, but their rationale could have been less barbaric than it at first appears.

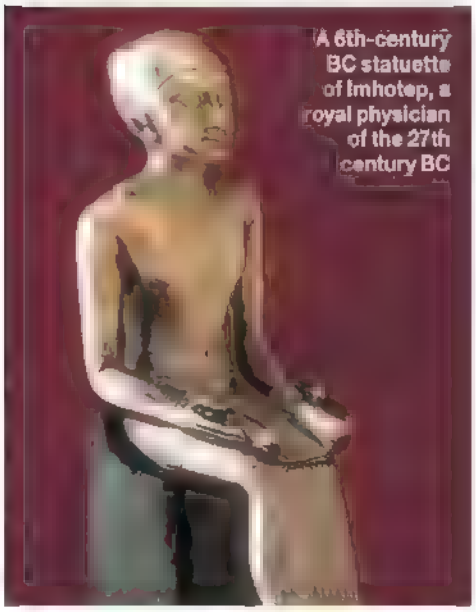
WELLCOME IMAGES

## 2 The medical specialists of ancient Egypt included the 'herdsman of the anus'

Magic, religion and rational science mingled without contradiction in ancient Egyptian healing. A sick person could consult a doctor (called a *swnw*), a magician or a lay priest – or all three, if the patient so desired. One practitioner might be both priest and doctor, curing via a combination of medicines, incantations and prayers.

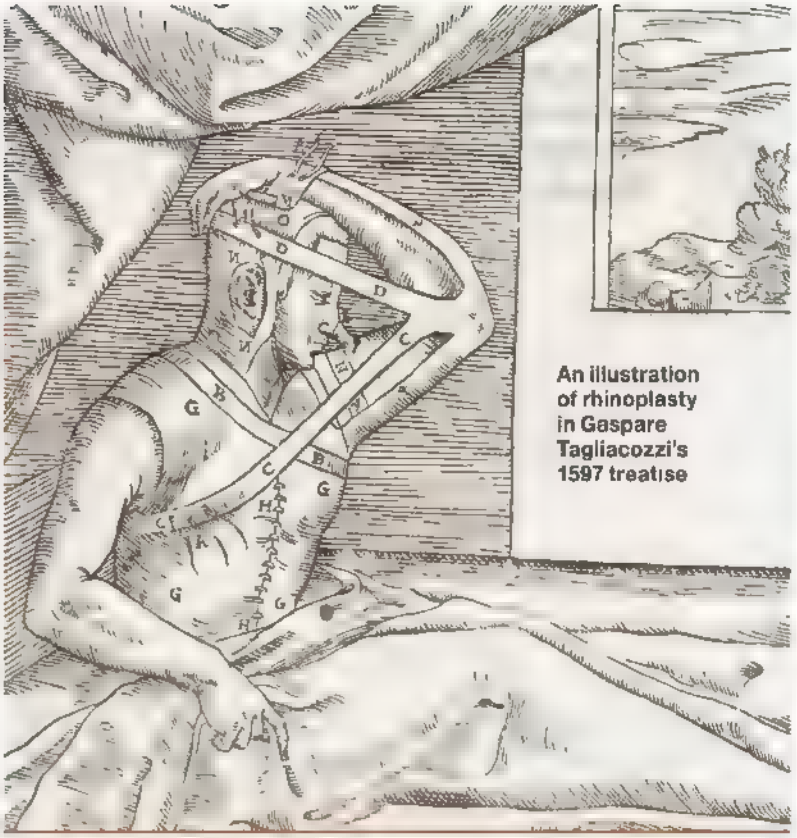
Egypt's system of medicine was the first to be set down in writing, but its history remained obscure until hieroglyphs started being decoded in the early 19th century. Since then, papyri and depictions in tombs have shown that doctors had an extensive knowledge of disease and a rich pharmacopoeia of herbs, animal products and minerals. Prescriptions were prepared according to precise recipes that included long lists of ingredients and their measurements, and took many forms including pills, ointments, inhalations and enemas.

One doctor particularly skilled in administering these enemas was Irenakhty, who lived around 2150 BC. He was doctor to the royal palace and, along with several other titles, held the position of *neru pehut* – herdsman of the anus. His proctological expertise was not a one-off: his predecessor, Khuy, was another anal guardian who combined the role with his skills as a dentist to ensure that both ends of the pharaoh's alimentary canal remained in tip-top condition.



A 6th-century BC statuette of Imhotep, a royal physician of the 27th century BC

WELLCOME IMAGES/GETTY



An illustration of rhinoplasty in Gaspare Tagliacozzi's 1597 treatise

## 3 Plastic surgeons have long been able to offer new noses for old

For many centuries surgeons have attempted to remedy the loss of a nose – whether it was the result of punishment, misfortune in sword-fighting or disease – to try to restore the patient's features and dignity.

Around 600 BC, the Indian surgeon Sushruta used a plant-leaf template to excise a flap of skin from the patient's cheek, leaving it attached by a strip called a pedicle. Twisting it so the wound surface remained downwards, Sushruta would suture it into the place of the missing nose and affix small reed tubes to act as nostrils.

Similar procedures re-emerged in Renaissance Italy, where two surgical families – the Brancas and the Vianeos – developed methods of creating a new nose from the skin of a patient's arm. These practitioners considered it worthwhile keeping the details secret from their competition. In 1597 Gaspare Tagliacozzi, professor of anatomy at Bologna, brought nasal reconstruction out into the open when he published *De Curtorum Chirurgia per Insitionem*, which aimed to describe rhinoplasty scientifically and to educate other surgeons in the procedure.

Tagliacozzi's operation involved making parallel incisions in the skin of the upper arm and drawing a linen dressing underneath the flesh. After about 14 days, he cut the flap at one end; another 14 days allowed the flap to mature. He then grafted it to the patient's nasal cavity, using a system of bandages to keep the arm and face together. After another 20 days he separated the arm from the nose (much to the patient's relief) and later shaped the graft appropriately. After Tagliacozzi's death in 1599, though, the operation fell out of favour.

It was not until the late 18th century that European surgeons realised that new noses were still being created in India. A letter to the *Gentleman's Magazine* in 1794 recounted the story of Cowasjee, an Indian bullock-driver in the British army, who was captured by a vengeful sultan and punished as a traitor: his nose and one hand were lopped off. An unnamed Maratha surgeon skilfully moulded a new nose from the skin of Cowasjee's forehead. British surgeon Joseph Constantine Carpue drew upon these reports to begin nasal reconstructions in 1814; his work revived interest in rhinoplasty and helped western surgeons to catch up with their Indian counterparts

## 4 Smoking was good for you

The words 'cigarettes' and 'health' are now unlikely bedfellows. Yet medical cigarettes prescribed for asthma in the 19th century were part of a long history of inhalation therapy that continues in the inhalers of today.

Ideas about the causes of asthma changed over the centuries, so the inhalation of herbal smoke fell in and out of favour depending on prevailing theories. By the end of the 18th century, asthma was being interpreted as a 'nervous' disease caused by spasms of the bronchi. Into this receptive medical environment came the plant *Datura stramonium*, or thorn apple. Between 1802 and 1810 the plant *Datura ferox*, smoked in India as a remedy for asthma, was brought to Britain by a physician working for the East India Company. Joseph Toulmin, a surgeon from Hackney, substituted the more readily obtainable *Datura stramonium*, gaining relief from his own asthma. Word of the new remedy quickly spread

At first, stramonium was smoked in ordinary tobacco pipes. It was possible to grow it oneself and dry the roots and stalks (though not the leaves, which have a dangerous narcotic effect). By the middle of the 19th century, smoking was socially acceptable and ever easier with the introduction of cigars, then cigarettes (and matches). Commercial brands of stramonium cigarettes fitted nicely into this context and were not seen as a quack remedy; doctors recommended them as a convenient way of inhaling the drug.

In the early 20th century the spasmodic model of asthma gave way to the concept of allergic inflammation, and smoking became seen as less therapeutic. At the same time, new drugs such as ephedrine provided an alternative to the potentially hallucinogenic stramonium. As the dangers of tobacco smoking became more apparent, medicated cigarettes declined in popularity – but, for a while, stramonium had played an important role in bringing relief to those struggling to breathe.

**A 1542 engraving of *Datura stramonium*, smoked to relieve asthma**

## 5 The first African-American female doctor graduated at the height of the American Civil War

In May 1869, a doctor addressed the annual meeting of the Massachusetts Anti-Slavery Society. Slavery had been abolished in 1865, and the doctor expressed strong hopes for the future for black people. She also gave a prescient warning: it would "take earnest labour on the part of their friends to secure them all their rights". The speaker was Rebecca Crumpler, the first African-American woman to graduate as a physician. She devoted her career to improving the health status of black people living in poverty, especially women and children.

Crumpler was born Rebecca Davis in Christiana, Delaware, in 1831. She married Wyatt Lee in 1852, settling at Charlestown, Massachusetts. There she worked as a nurse for local physicians, and these employers supported her successful application to the New England Female Medical College Her husband died of tuberculosis in 1863 but she persisted with her studies and graduated the following year as 'doctress of medicine'. She briefly practised in Boston before travelling to Saint John in New Brunswick, Canada, where she married Arthur Crumpler in May 1865. She is now remembered as Rebecca Lee Crumpler, although she does not appear to have continued using the name Lee after her second marriage. Sadly, no identifiable photos of her have survived.

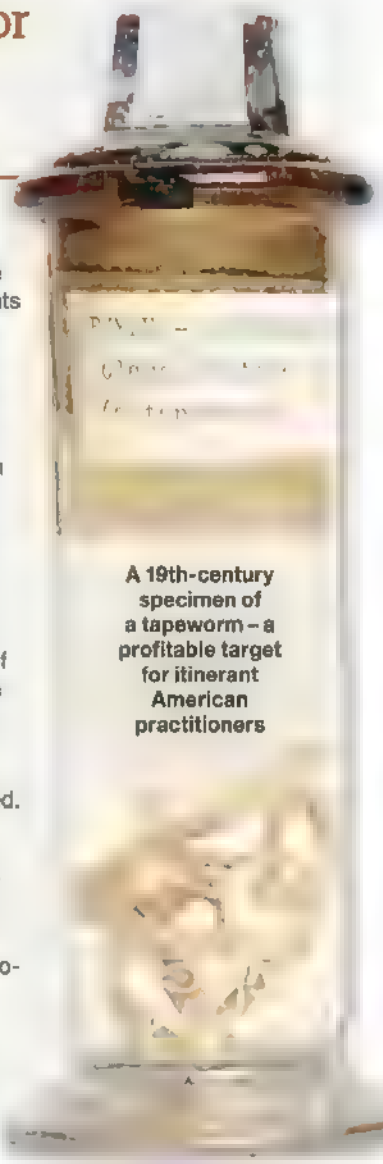
After the end of the American Civil War, Crumpler went to Richmond, Virginia, to work for the Freedmen's Bureau, a government agency assisting freed slaves and impoverished white people in the former Confederate states. Despite her degree, she is listed in the records as 'nurse', paid $10 per month. As she later explained, however, this part of her career was the "real missionary work" to which she felt called. Serving a population of 30,000 black people emancipated from slavery yet still experiencing violent discrimination, she focused on assisting the poorest families.

Crumpler's *A Book of Medical Discourses* (1883), was one of the earliest medical publications by an African-American writer, and specifically spoke to a female readership. Crumpler realised that knowledge is power and that encouraging women to be active in protecting their own health and that of their children would improve their lives within a difficult context.

GETTY

Freed slaves in South Carolina during the American Civil War. Dr Rebecca Crumpler worked among similar communities

## 6 The tapeworm doctor could expel your unwanted passengers



A 19th-century specimen of a tapeworm – a profitable target for itinerant American practitioners

The beef tapeworm *Taenia saginata* can grow to over 20 metres long in the human intestines. As is also the case with its shorter but meaner cousin, the pork tapeworm, it absorbs nutrients from the contents of the digestive system and can survive for years – unless, that is, its host decides to evict it.

In late 19th- and early 20th-century America, the tapeworm provided a profitable career for itinerant practitioners, who travelled from town to town parting people from their intestinal inhabitants. Such tapeworm specialists are not exactly much-fêted heroes in the history of medicine, but their activities give an insight into the healthcare options available to rural communities.

The worm doctor would begin treatment by advising the patient to fast for a day to get the worm hungry, then to take a teaspoon of the essential oil of male fern in a cup of warm milk. The infested person would then lie down for a few hours before taking a draught of castor oil, turpentine and croton oil – the latter being toxic and a drastic laxative. The spectacular effects of this mixture can readily be imagined.

Some tapeworm specialists were showmen, impressing the punters by displaying preserved 'worms' of enormous length. These were more likely to be fakes made from animal entrails than the real thing, so the tapeworm doctor became a fairly disreputable character. He's unlikely to be commemorated with a statue outside a hospital, nor with a reverent biography detailing his selfless quest for medical progress, but he was part of the colourful roster of healthcare providers to whom the average person turned when unable to afford a physician.

## 7 Plague and inequality combined forces at the turn of the 20th century

The word 'plague' sounds inherently medieval, but the Third Plague Pandemic finished within living memory. Previous pandemics had wiped out large numbers indiscriminately, but this one disproportionately affected those living in poverty, highlighting the global health inequality that has been worsening ever since. (See page 42 for images of the pandemic.)

The Third Pandemic emerged in China in the 1850s; several decades later, during the 1890s, it began crossing international borders. From Hong Kong in 1894, rats infested with plague-carrying fleas started travelling the world on colonial supply ships, taking their lethal bacteria to every inhabited continent.

In that year the bacterium *Yersinia pestis* was isolated independently by Alexandre Yersin and Kitasato Shibasaburo. In 1898 Paul-Louis Simond established that the rat flea was the vector, or transmitter. But as the disease spread to international ports, health officials responded by imposing quarantine programmes that isolated suspected sufferers to prevent the disease being passed from one human to another.

Draconian measures by the British government in India led to political unrest; in the US, existing anti-Asian prejudice fed on the disease's Chinese origin. When the plague reached Cape Town via Argentina in 1901, its first victims were dockworkers. South Africa's colonial government used this as a pretext to remove the African population of District Six, forcing them under armed guard to a location outside the city at Uitvlugt (later renamed Ndabeni). Segregation, which had been regularly mooted – ostensibly on health grounds – for the previous two decades, began in earnest.

The Third Pandemic killed around 15 million people, the majority in Asia and Africa. Though its pandemic status officially ended in 1959, plague has never been eradicated. And though *Yersinia pestis* remains susceptible to the antibiotic streptomycin, multi-drug-resistant strains occasionally surface. It's to be hoped that future historians do not have to analyse a Fourth Plague Pandemic. ■

**Caroline Rance** is a writer who specialises in the history of medical advertising and health fraud. She blogs at *thequackdoctor.com*


REAL COL. CREM.
DE VISCER. LIB. XI
intestina a ventriculo exoriuntur, eodemq; pene substantia videntur licet aliquantulũ tenuiora. Situs eorũ est, ab inferiori ventriculi orificio ad anum usque, ab eoq; usque ad imum ventrem partim occupant. Veteres Anatomici intestina in sex partes distinxere, distinctisq; singulas nominibus
appellauere. Ego uero si post tot seculorũ ceptia uocabula noua aliquid in medium proferre fas esset, intestina duo esse dicerem quorũ alterum in tenue est crassũ alterum. Sed ut aliorum uestigia sequamur, sex esse dicamus intestina. Quorũ primum ileum, cæcum, colon, rectumque.

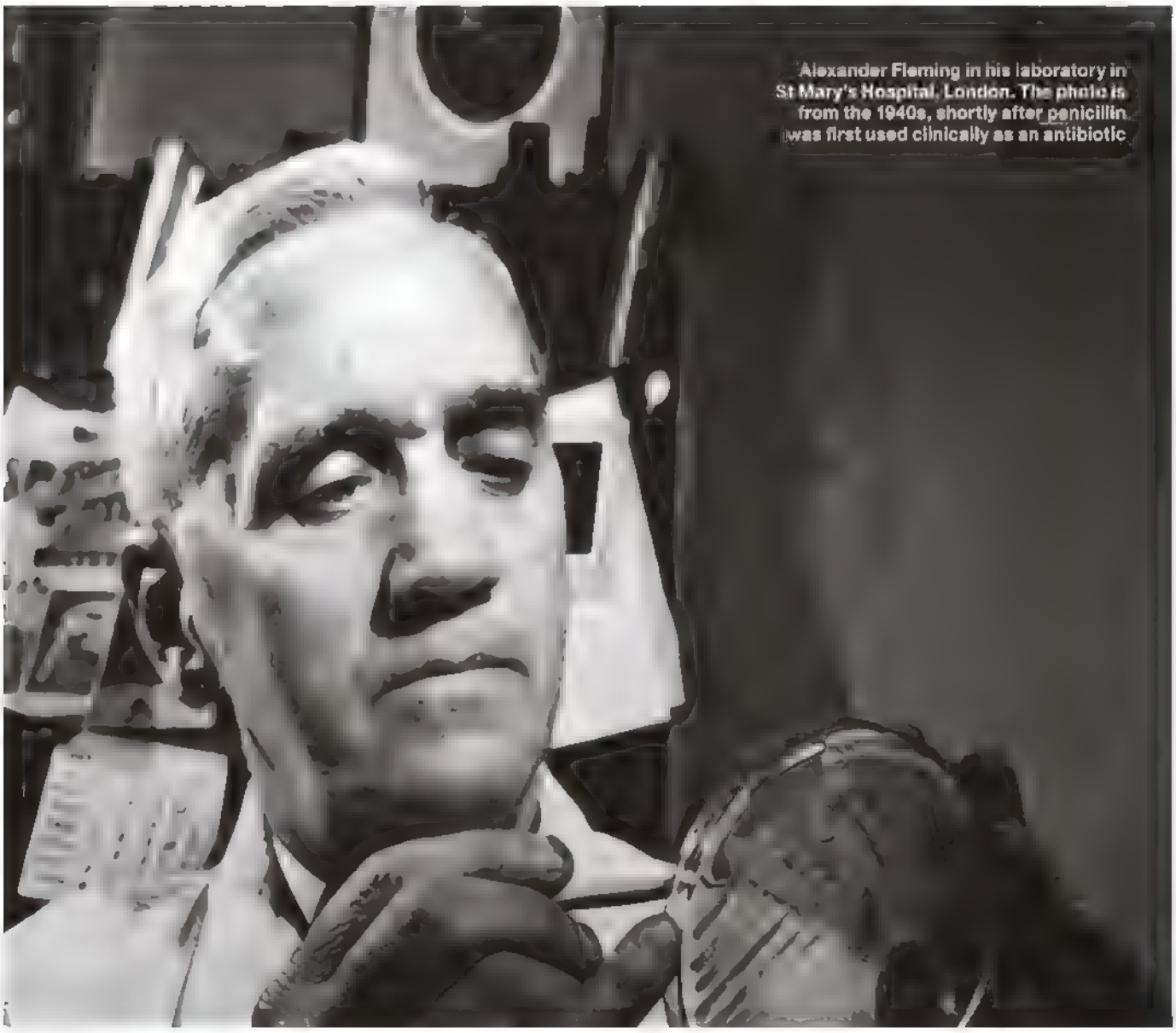
EYE OPENER

## MASTER CLASS

Renowned surgeon and medical author John Banister gives an anatomy lesson at the Barber-Surgeon's Hall in London around 1580.

A 1540 act of parliament created a combined Company of Barbers and Surgeons of London, which was granted four bodies from the Tyburn gallows each year for the purpose of dissection and anatomical teaching. Despite this, cadavers for dissection and study remained in short supply for centuries afterward.

# PENICILLIN
# WHEN MOULD MADE MEDICAL HISTORY



Alexander Fleming in his laboratory in St Mary's Hospital, London. The photo is from the 1940s, shortly after penicillin was first used clinically as an antibiotic

GETTY IMAGES

Not all breakthroughs are the result of decades of scientific learning – serendipity also plays a role. **Dominic Sandbrook** recalls how Alexander Fleming's poor housekeeping led to a momentous discovery

"When I woke up just before dawn on 28 September 1928, I certainly didn't plan to revolutionise all medicine by discovering the world's first antibiotic, or bacteria killer," remarked Alexander Fleming, years afterwards. "But I suppose that was exactly what I did."

The story of Fleming's 'discovery' of penicillin, the groundbreaking antibiotic that saved so many lives, remains one of the most inspiring in scientific history. A brilliant bacteriologist at St Mary's Hospital in London, the stocky Scotsman had just returned from holiday with his family. Before leaving, he had been studying staphylococcus, the type of bacteria that causes septic infections. Incurably untidy, Fleming had left a great pile of bacterial cultures heaped in a corner of the laboratory. On his return from holiday he noticed that one of the Petri dishes had become contaminated with a blue-green mould. Around the mould, the dish was clear of bacteria, almost as if the mould itself had killed them. Puzzled, Fleming showed the dish to his assistant, Merlin Pryce. They discovered that the mould was a strain of *Penicillium*, which Fleming assumed had got in through an open window.

And that, the legend goes, was that. Fleming had his wonder drug; the world had its antibiotic. The real story, though, is rather more complicated.

In fact, when Fleming set his graduate students to work on the mould, hoping that its 'juice' – which he later named penicillin – would prove to be a natural and harmless antiseptic, the early results were disappointing. The juice worked painfully slowly, and Fleming found it hard to keep the concentration sufficiently high around infected areas. The wonder drug, it seemed, was not so wonderful. And when he published his findings in the *British Journal of Experimental Pathology* in the summer of 1929, the reception was less than ecstatic. Fleming discussed penicillin's potential as a natural antiseptic to kill septic and pneumonia germs, but he made no great claims for its role as a general antibiotic. His big day in September, it appeared, had not been quite so big after all.

In the decade that followed, Fleming lost interest in penicillin. It would not last long enough in the human body, he concluded, to make a major difference. But in 1938 Howard Florey, an Australian pathologist working at Oxford, together with Ernst Chain, a Jewish refugee from Nazi Germany, began to look into Fleming's work. With the assistance of Dorothy Hodgkin, a pioneering chemist, they worked out the chemical structure of penicillin, devised a way of mass-producing it, and carried out the first successful clinical trials. When Fleming read about their experiments, he telephoned Florey and announced that he was coming to Oxford to see their results. "Good God!" said Chain. "I thought he was dead."

At first, Fleming seemed delighted with the Oxford group's application of 'his juice'. But as time went by and the British and American governments, conscious of penicillin's potential, started encouraging mass production, rivalry began to grow. In August 1942, the Oxford scientists gave Fleming enough penicillin to treat one of his brother's employees, who was suffering with septicaemia. But a month later, a controversy broke out in the letters pages of *The Times*, with the chemists from St Mary's and Oxford openly bickering over who was the real 'inventor' of penicillin. Journalists flocked to both laboratories and found Fleming's story by far the more compelling: the romantic tale of a lone scientist, this shy scholarship boy from rural Ayrshire who, through hard work, inspiration and sheer good luck, had discovered a drug that changed human history. From that point onwards, the legend of September 1928 was set in stone.

**The original culture plate on which Scottish scientist Alexander Fleming first observed the growth of the *Penicillium* mould**

MARY EVANS

Without antibiotics such as penicillin, **tens of millions of people would have died young**

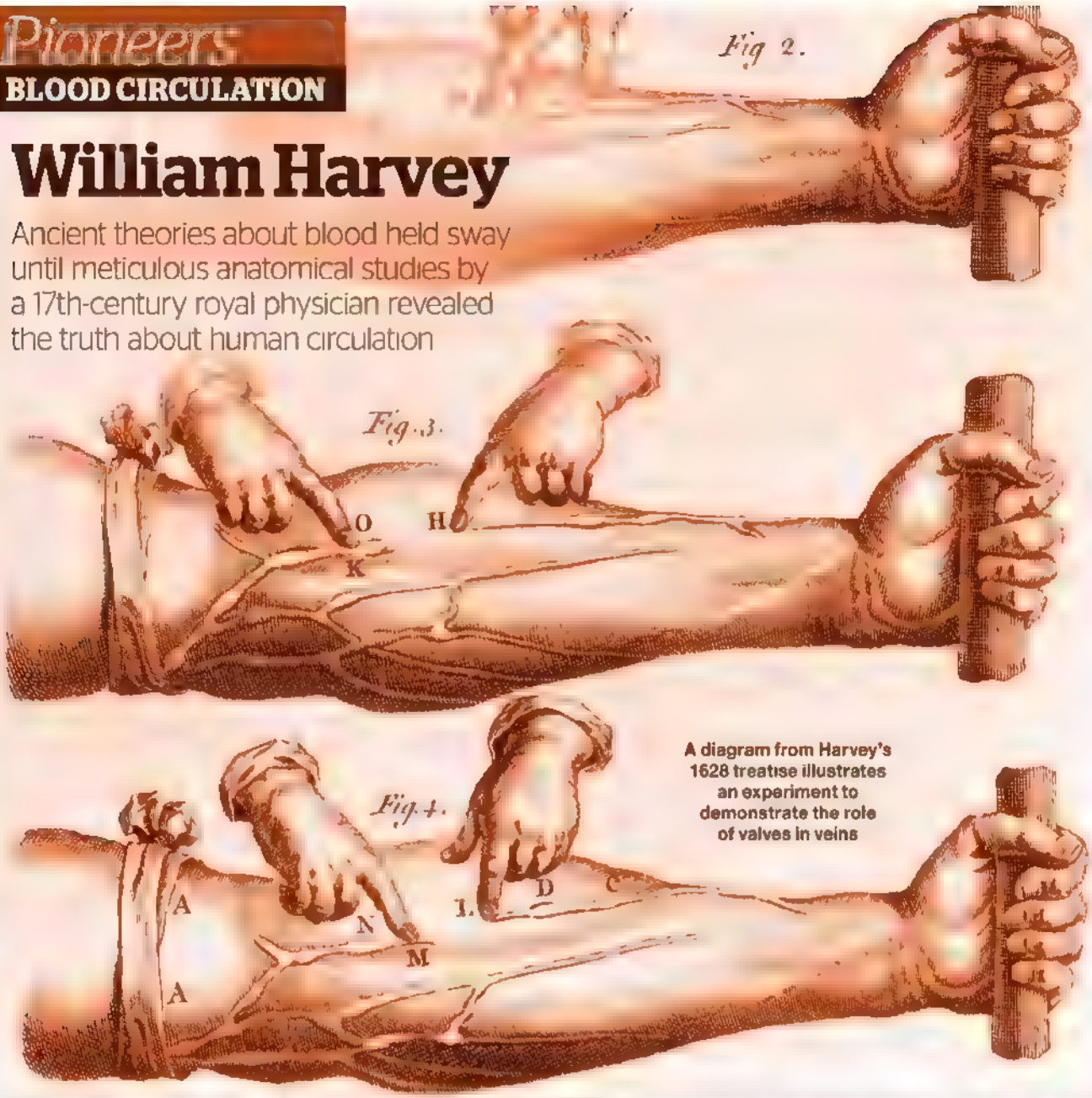
The impact of antibiotics in recent history is almost impossible to overstate. It is surely no exaggeration to say that without them tens of millions of people would have died young. The tale of 28 September gave this story a satisfyingly iconic hero and turned it into a parable about the role of serendipity in scientific discovery. Yet, to his credit, Fleming himself knew that it was a legend, even calling it the "Fleming myth". Scientific breakthroughs are rarely the work of one man working in isolation; true eureka moments are almost unknown.

"Developing penicillin was a team effort, as these things tend to be," Howard Florey said later. But the events of 28 September 1928 make a better story – and that, of course, is why they will never be forgotten.

**Dominic Sandbrook** is a historian, writer and broadcaster

# William Harvey

Ancient theories about blood held sway until meticulous anatomical studies by a 17th-century royal physician revealed the truth about human circulation




A diagram from Harvey's 1628 treatise illustrates an experiment to demonstrate the role of valves in veins

Strange as it now seems, before 1628 it was believed that blood came from food in the liver, then entered the heart, where it was heated before it shot out into the veins – hence Shakespeare wrote how "The blood … Runs in your veins".

William Harvey (1578–1657), physician to King James VI and I, made a meticulous study of the plumbing of the chest. He came to the conclusion that the heart didn't heat the blood but drove it into the arteries. The Italian anatomist Hieronymus Fabricius had earlier established that veins are lined with valves; Harvey realised that these valves allow the movement of blood only towards the heart (not away, as had previously been believed), completing the circuit.

Working in the pre-microscope age Harvey didn't know how blood got from the arteries to the veins, but he boldly posited the existence of invisibly tiny vessels. He was right, of course, and these vessels were later identified as capillaries.

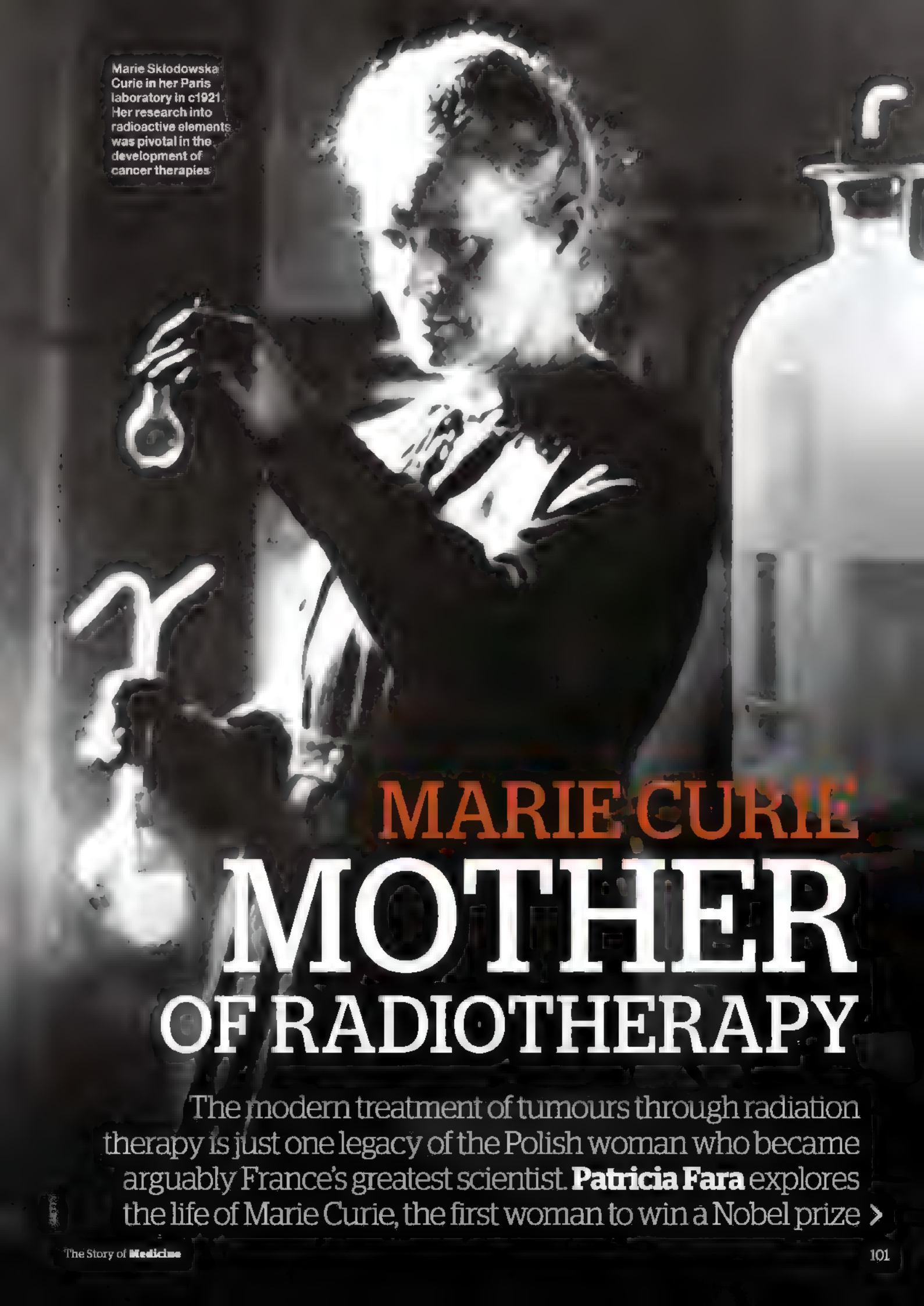
Harvey's discovery was of colossal importance. An understanding of the circulation was crucial, because without it other later discoveries wouldn't have been possible. Without a knowledge of circulation modern surgery could not be undertaken, for example, nor injections given.

**Harvey's theory almost ruined his career** as a doctor, and caused him a considerable amount of financial distress

Harvey's theory was published in 1628 in his book *Exercitatio Anatomica de Motu Cordis et Sanguinis in Animalibus* (*An Anatomical Exercise on the Motion of the Heart and Blood in Living Beings*). You might think that after its publication he would have been inundated with patients – yet it almost ruined his career as a doctor. This was an era when doctors were loathe to contradict the teachings of ancient medics, particularly the second- and third-century AD Greek physician Galen. Good doctors, it was thought, dispensed medicine and diagnosed purely in accordance with those ancient tenets. So, curiously, this great medical leap forward caused a considerable amount of financial distress to its discoverer. H

*Words: Allan Chapman*

GETTY



Marie Skłodowska Curie in her Paris laboratory in c1921. Her research into radioactive elements was pivotal in the development of cancer therapies

# MARIE CURIE
# MOTHER OF RADIOTHERAPY

The modern treatment of tumours through radiation therapy is just one legacy of the Polish woman who became arguably France's greatest scientist. **Patricia Fara** explores the life of Marie Curie, the first woman to win a Nobel prize ›

If you were a French soldier injured on the front line during the First World War, you may have been among the first to be X-rayed in a portable radiography unit – probably unaware that the woman surveying your wounds was not just a caring nurse but also a double Nobel Prize winner. Yet the development of ambulances fitted with X ray equipment was the brainchild of the scientist who invented the word 'radioactivity' – and who fitted, drove and operated these 'Little Curies' herself.

Though Marie Curie is celebrated worldwide as France's greatest scientist, it was her adopted country through marriage to a Frenchman. Born Maria Skłodowska in Warsaw in 1867, as a rebellious young woman she defied the ban on speaking Polish imposed by that city's Russian occupiers. Her staunch loyalty to her native Poland is evident in the name she coined for the first element she discovered, polonium (the second was radium); in addition, she hired Polish governesses to ensure that her two daughters were bilingual, and after her marriage she called herself Marie Skłodowska Curie.

In the late 19th century Polish universities would not accept women, so in 1891 Maria Skłodwoska moved to Paris where she earned two science degrees and began investigating the magnetic properties of steel. A few years later, two momentous events changed her life: in 1896 the French physicist Henri Becquerel accidentally discovered that uranium compounds affect a photographic plate, a year after Marie had married her supervisor, Pierre Curie. Bound together romantically and scientifically, the couple dedicated themselves to investigating the mysterious phenomenon.

CLOCKWISE FROM TOP LEFT Irène and Marie Curie during the First World War; Pierre (centre) and Marie Curie in their lab in the early 20th century; Pierre and Marie on a bicycle trip during their honeymoon in 1895; on a fundraising trip to the US in 1921; Marie and Irène teaching Americans in Paris in 1919; Marie with daughters Eve (left) and Irène in 1908

## Atomic ambition

From the beginning, this was Marie's project. Fiercely ambitious, she was determined to establish her reputation but refused to reap any financial benefits from her research – which in any case, under French law, would have gone to her husband. Ahead of her contemporaries, Marie Curie correctly identified the source of radioactivity as being inside atoms, which until then had been thought of as indivisible units. Using an electrical instrument invented by Pierre and his brother 15 years earlier, she deduced that the intense radioactivity of uraninite (then known as pitchblende), a side-product of coal production, indicated that it must contain other unstable elements besides uranium.

That was a key insight. Desperately underfunded, the couple embarked on the arduous task of manually refining many tonnes of tarry material to isolate minute quantities of radioactive compounds. In 1903, having finally produced a tiny phial of glowing radium chloride, Marie and Pierre were awarded a Nobel Prize for physics (jointly with Becquerel). At last they had enough money for assistants and better equipment; they had hitherto conducted their work on pitchblende in a laboratory described by another scientist as "a cross between a stable and a potato shed".

Marie suffered from fatigue caused by overwork and radium; her favourite **remedy was cycling in the countryside**

From its first announcement, radium was welcomed as a wonder drug – a natural source of energy guaranteed to revitalise unhealthy bodies. While cosmetic companies made small fortunes by promising shiny hair and glowing skin, the Curies invested their own time and money in investigating how tumours could be destroyed. Nonchalant about handling large amounts of radioactive materials, they both suffered skin burns and debilitating illnesses.

The Curies' scientific and marital idyll was destroyed in 1906 when Pierre died after being run over by a horse-drawn wagon in Paris. Marie was left to bring up their two little girls, scientific Irène, who later also shared a Nobel Prize, and musical Eve. Devastated, Marie struggled on at the laboratory, isolating radium and winning a second Nobel Prize (in chemistry) for her own work. Despite her

GETTY

GETTY/ALAMY/SHUTTERSTOCK

exceptional achievements, though, this was a profoundly unhappy period. Lambasted by hostile journalists for conducting a love affair with Pierre's friend Paul Langevin, she sunk into depression after being slated in the press as a "foreign whore" corrupting France's greatest scientists.

The Curies had been among the first to suggest that radiation might be used in the treatment of tumours. Marie's international acclaim provided invaluable leverage to help her persuade the French government to subsidise her Curie Institute in Paris, today still a world-leading centre for cancer research and treatment. During the First World War her fleet of mobile X-ray units treated up to one million soldiers, and in 1921 this woman who shunned publicity reluctantly embarked on a tour of the US to obtain a gram of American radium (which had become astonishingly expensive) for her Paris institute. Eight years later she returned for a second visit to raise funds for the medical research institute she established in Warsaw. By this time she was suffering from extreme fatigue caused by overwork and the effects of radium; her favourite remedy was cycling in the countryside.

Marie died of aplastic anaemia, probably as a result of decades of exposure to radiation, in 1934. Her research laid the foundations for medical discoveries that revolutionised cancer treatments over the past century

**Patricia Fara** is president of the British Society for the History of Science and the author of *Science: A Four Thousand Year History* (Oxford University Press, 2009)

DISCOVER MORE

**BOOK**

▶ **Madame Curie: A Life** by Susan Quinn (William Heinemann, 1995)

## Three more cancer pioneers

**Advances in diagnosis and treatment owe much to the work of these three men**

### Percivall Pott: Identified a carcinogen

Tumours have been investigated since the days of the ancient Egyptians, but it wasn't till the late 18th century that a specific carcinogen was identified. In London in 1775 the surgeon Percivall Pott demonstrated that soot was a cause of scrotal cancer among chimney sweepers. Although the cruel practice of sending young boys up hot chimneys was decisively abolished in 1875, the same chemical – inhaled by cigarette smokers – still causes lung cancer.

### Rudolf Virchow: Discovered leukaemia

Often celebrated for making medicine scientific, this German physician made the crucial link between certain cancers and the inflammation associated with white blood cells. He correctly identified the blood disorder he named leukaemia in 1847, but his theories were taken seriously only towards the end of the 20th century, when the beneficial effects of anti-inflammatory drugs such as aspirin became appreciated.

### Georgios Papanikolaou: Devised the pap test

Cervical smears have saved millions of women's lives by providing a low-cost screening method for observing cancerous cells under a microscope. The Greek pathologist Georgios Papanikolaou first described his non-invasive technique to an American audience in 1928, but it was not until 1943 that the value of his Pap test for preventing uterine and vaginal cancers was fully recognised.

# MEDICINE'S BIG BANG

**Adrian Washbourne** explores ten key 19th-century scientific developments that transformed the field of medicine

Scientific medicine as we know it today is a product of the modern age. Until the 19th century, medical ideas and practices had remained much the same for hundreds of years. Yet within the space of a few years following the white heat of the French Revolution, massive political changes would lead to fundamental alterations in all systems of learning throughout Europe – including virtually everything about western medicine.

By 1800, practitioners had begun to abandon the classical idea that illness came about as an imbalance of fluids or energies – the so-called 'humoral theory' – and started to think of disease as being based on local changes in the body's tissues. A new type of medical man – the general practitioner – appeared, and hospitals began to increase in numbers and acquire their many roles in teaching and research as well as care. These medical institutions, together with our knowledge of anatomy and surgery, would be the only elements that survived intact into this brave new medical world.

This 1813 etching by Thomas Rowlandson shows a doctor examining his patients for suspected food poisoning

WELLCOME LIBRARY

## ▼ CLINICAL MEDICINE

A new emphasis on careful direct observation and hands-on practice was backed by new technology

The chaotic years after the end of the Terror (the repressive regime that employed mass executions to uphold the French Revolution) in 1794 gave a group of Parisian medical reformers the chance to implement changes in medical thinking and training that they'd been discussing for over a decade. French chemist Antoine Fourcroy's cry: "little reading, much seeing and much doing" would be the foundation of new teaching, away from traditional patient-free confines of the lecture room. The radical aim was to observe at the bedside and with a hands-on approach, adopting manual 'sensory' practices to find out what was happening inside the body. To this end René Laennec's 1816 invention, the stethoscope, was a boon, enabling medical men to 'see' inside the body through hearing.

**Hearing disease: an early binaural stethoscope from 1858**

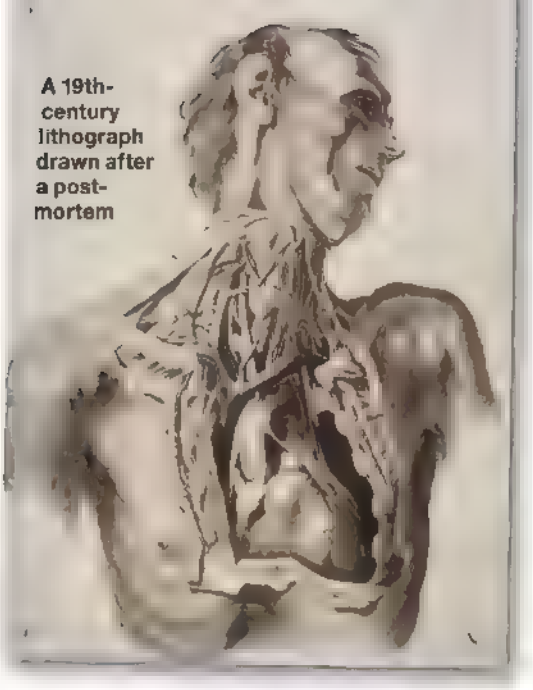
## ◀ DOCTOR-PATIENT POWER

Clinicians learned to diagnose and treat the ailment, not concentrate on the patient's characteristics

Clinical medicine spelled the end of 'the patient as person'. Previously, it was considered that a patient's characteristics and life history should be taken into account by the doctor when he made his diagnosis. But from the early 19th century the doctor learned to mentally detach the patient from the disease. For better or worse, diagnosis became distanced and impersonal – it was scientific, where previously it had been holistic. The strict training that a doctor now received gave him the authority to override the patient's wish to be seen as special and unique.

WELLCOME LIBRARY/DREAMSTIME

A doctor now had the authority to override **the patient's wish to be seen as special and unique**



**A 19th-century lithograph drawn after a post-mortem**

## ▲ THE POST-MORTEM

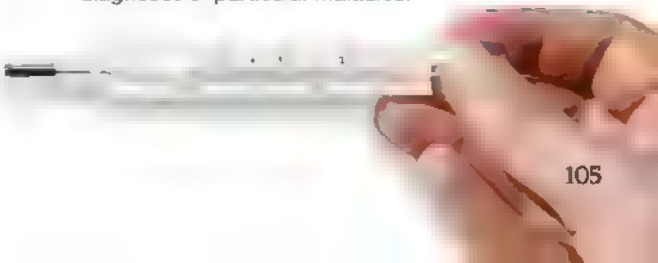
Large-scale systematic examination of cadavers boosted knowledge and classification of diseases

In Paris in the early 19th century, medics at several of the large hospitals for the poor had total access to the patients on the wards, and could freely dissect their corpses after death. Opening up bodies to look for the cause of death wasn't new, but the big breakthrough in understanding disease came from systematic post-mortems on large numbers of patients to classify every disease. Correlating these findings with external signs that a clinically trained medic could observe on a patient's body now meant that he could not only see these external signs but properly read them.

## ▼ THE THERMOMETER

Understanding how to use this simple tool revolutionised diagnosis of a host of common diseases

The pathological significance of heat in fever was already widely known, but it wasn't until this new era of scientific medicine that medical men argued body temperature was a key indicator in diagnosing disease. In 1868 Carl Wunderlich published *On The Temperature in Diseases*, a study of temperature readings from 25,000 patients suffering from 32 diseases. It was shown that just two thermometer readings a day were needed to obtain the crucial information, and since absolute accuracy wasn't vital nurses and even relatives could take temperatures. Fluctuations in body temperature could be used to suggest diagnoses of particular maladies.



## SISTERS OF CHARITY

The introduction of professional nurses boosted standards of care in public hospitals

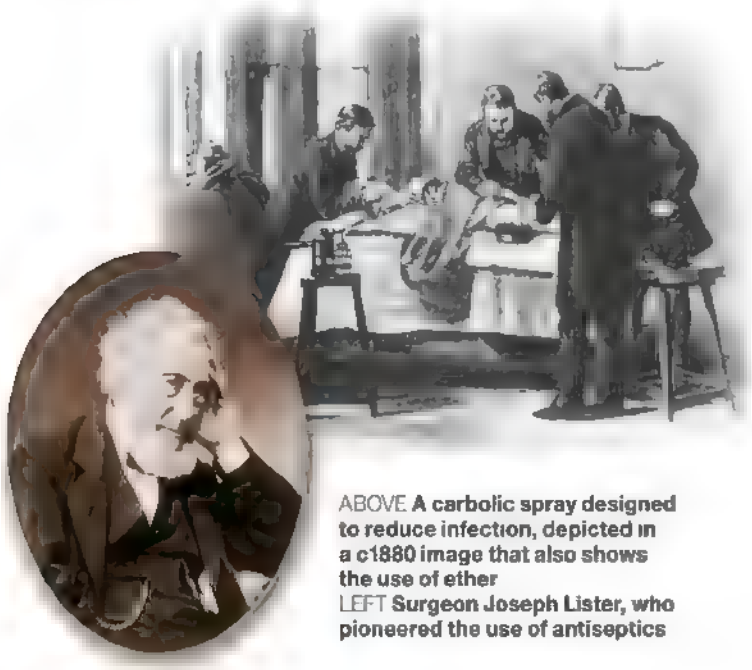
The great reformer of nursing, Florence Nightingale, transformed the image of the nurse from someone who was often an unskilled domestic servant to a young, neat, clean and uniformed woman trained to work in public hospitals and establish a higher standard there. It was a vocation – a role that girls of good character increasingly felt they were called to undertake, and one that enabled girls from respectable households to earn their own living without shaming their families. The Nightingale nurse was to become a vital ancillary – a handmaiden – to the medical men of the hospitals.

**A professional nurse, in a c1890 advert for Jeyes' disinfectants**

## CLEANLINESS

Improved understanding of hygiene helped reduce levels of infection in surgery and childbirth

Besides the need to deaden pain, controlling infection was the major problem hindering progress in surgery. It was widely known, for example, that infection during childbirth was more likely in hospital than with home deliveries. A 'school of cleanliness and cold water surgery' was established in London in the mid-19th century by Thomas Spencer Wells, and many surgeons began to adopt cleanliness that enabled them to perform surgery with greater safety. But it is Joseph Lister who is attributed with developing this into the surgical routines we see today and supporting it with proper scientific argument. His method was based on antisepsis – killing any infective agents present in the wound with carbolic acid.



ABOVE **A carbolic spray designed to reduce infection, depicted in a c1880 image that also shows the use of ether**
LEFT **Surgeon Joseph Lister, who pioneered the use of antiseptics**

**A surgical patient is treated under ether in 1847**

## ANAESTHETICS

Gases and local anaesthetics enabling pain-free surgery revolutionised treatments

Before the introduction of anaesthesia, pain had not prevented surgery – but had made it almost unbearable. Speed was the order of the day – the only way to minimise shock and loss of blood. The scientific revolution in chemistry included experiments with nitrous oxide ('laughing gas') and ether to dull pain. But it was with chloroform – which didn't produce the worst side effects of those other gases – that anaesthesia began to gain acceptance. However, general anaesthesia could prove dangerous, and the search for a way to numb specific areas for local surgery continued. Cocaine synthesised by the Merck Drug Company was introduced as a local anaesthetic in 1885.

MARY EVANS/GETTY IMAGES

GETTY IMAGES/DREAMSTIME

## GERM THEORY

Discovering the role of microorganisms in disease influenced both surgical hygiene and vaccinations

The germ theory of disease posits that many illnesses are caused by invisibly small organisms entering our bodies. This was quite different from earlier views – that diseased bodies had spontaneously gone wrong in some way. Louis Pasteur's mid-19th-century research into wine and fermentation, and his idea that each different "disease of wine" is caused by a specific micro-organism, gave this theory enormous impetus. But even the vaccines that Pasteur later devised – one of which saved the life of a boy bitten by a rabid dog – failed to convince some medics, who for decades would continue to believe that 'miasmas' in the air caused diseases.

## ▲ THE LABORATORY

Advances in lab usage helped unite the work of researchers and clinicians

The new breed of laboratory researchers prided themselves on creating a distinct scientific medicine based on microscopy, vivisection and testable factors in a very controlled environment. No longer was the hospital doctor the only person who could speak with authority on the identity of an infectious disease. Many surgeons and physicians felt themselves under attack: could a doctor's good eye at the bedside really be reduced to numbers, instruments and rules? Canadian clinician William Osler (pictured above) successfully united the worlds of the clinic and laboratory by developing small labs in the wards for physicians to pursue their diagnoses.

## ▶ COLONIAL MEDICINE

Applying knowledge learned in Europe led to revelations in the tropics

Anopheles mosquito: malaria carrier

Western medicine was disseminated widely by European empire builders. Medics in the colonies, faced with an unknown disease, didn't blame it on the heat and moisture but looked – rather like Pasteur and other scientific researchers would have done – for a microscopic organism living in the human host. Colonist medics found new parasites unlike anything seen before. In the second half of the 19th century the Scottish parasitologist Patrick Manson pioneered this new discipline of tropical medicine and contributed to the discovery of the cause of malaria.

**Adrian Washbourne** is a BBC Radio producer

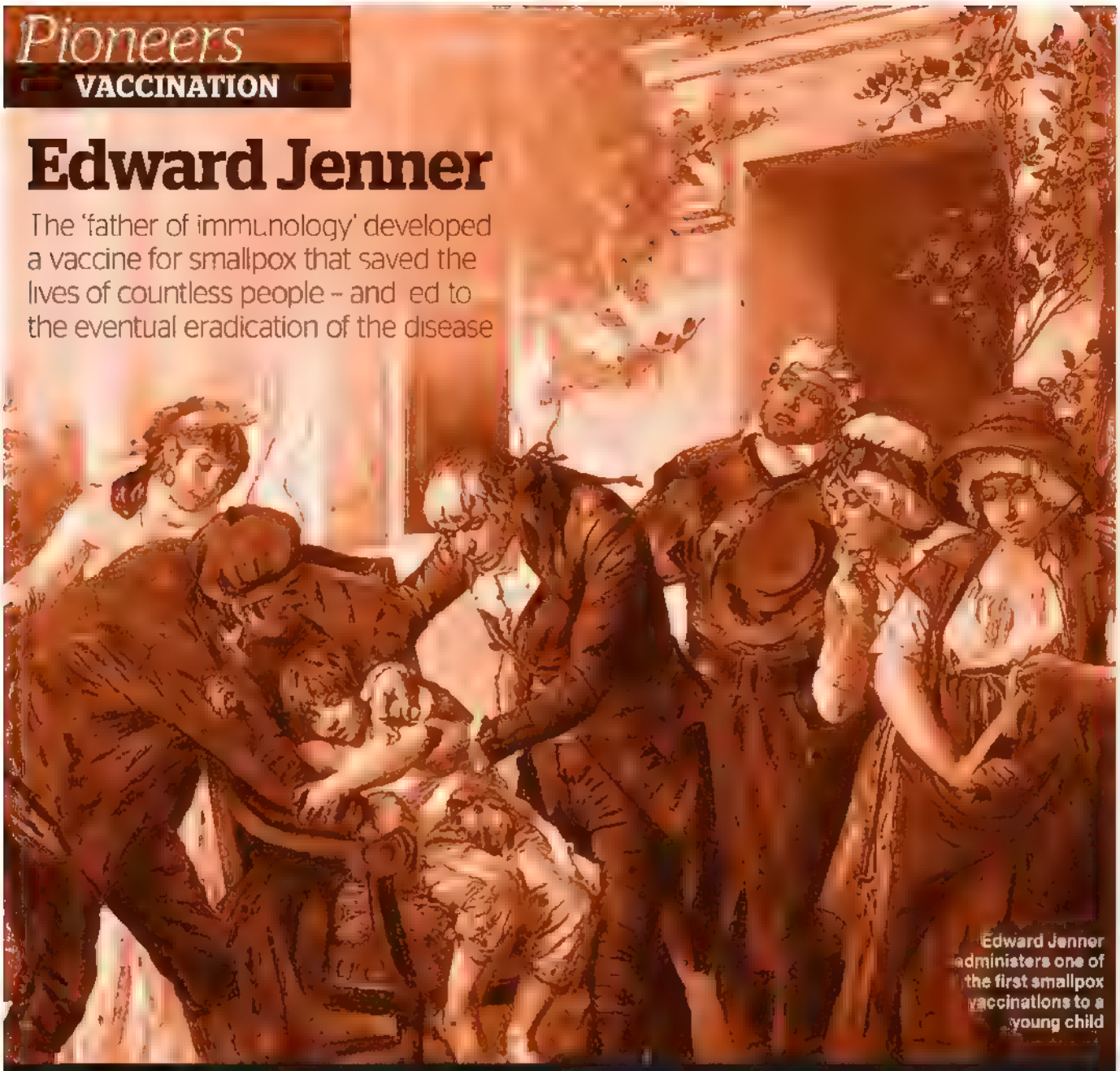
### DISCOVER MORE

**RADIO**

▶ **The Making of Modern Medicine** is available on BBC Radio Player at. *bbc.co.uk/programmes/b00773x8*

# Edward Jenner

The 'father of immunology' developed a vaccine for smallpox that saved the lives of countless people – and led to the eventual eradication of the disease



Edward Jenner administers one of the first smallpox vaccinations to a young child

One of the most celebrated medical innovators in history, Edward Jenner (1749–1823) was a Gloucestershire vicar's son who from an early age had an intelligent interest in everything around him. He studied medicine locally and then in London under John Hunter, one of the greatest surgeons of the day. Declining a partnership with Hunter, he worked in Berkeley as a country doctor, riding out in all weathers to visit his patients.

The scourge of his age was smallpox, an infectious viral disease that killed thousands and left many survivors blind or disfigured. Jenner, like many others, practised variolation, exposing healthy patients to material from smallpox victims in the hope that a mild dose would confer immunity. Though usually effective, it could result in full infection and death.

Jenner was aware that milkmaids who'd caught cowpox, which is mild in humans, didn't contract smallpox. Jenner studied the matter, discussing it with Hunter and local colleagues. On May 14 1796 he infected eight-year-old James Phipps with cowpox; variolated with smallpox six weeks later, the boy suffered no ill effects. After further 'vaccinations' of local people, he declared that cowpox produced immunity to smallpox – a safe alternative to variolation.

**Jenner persuaded Napoleon to release British prisoners of war**, the latter saying he could refuse nothing to such a man

Some medics were sceptical, and for many people the idea of being infected with a disease of cattle was repellent; James Gillray's famous 1802 cartoon shows peasants sprouting cows' heads after vaccination. But once the efficacy of vaccination was accepted, Jenner was lauded worldwide. He even persuaded Napoleon to release British prisoners of war, the latter saying he could refuse nothing to such a man as Jenner.

In 1801 Jenner claimed that "the speckled monster" could be quashed. In 1979, after an epic vaccination campaign, the World Health Organization declared that smallpox had become the first infectious disease in history to be eradicated.

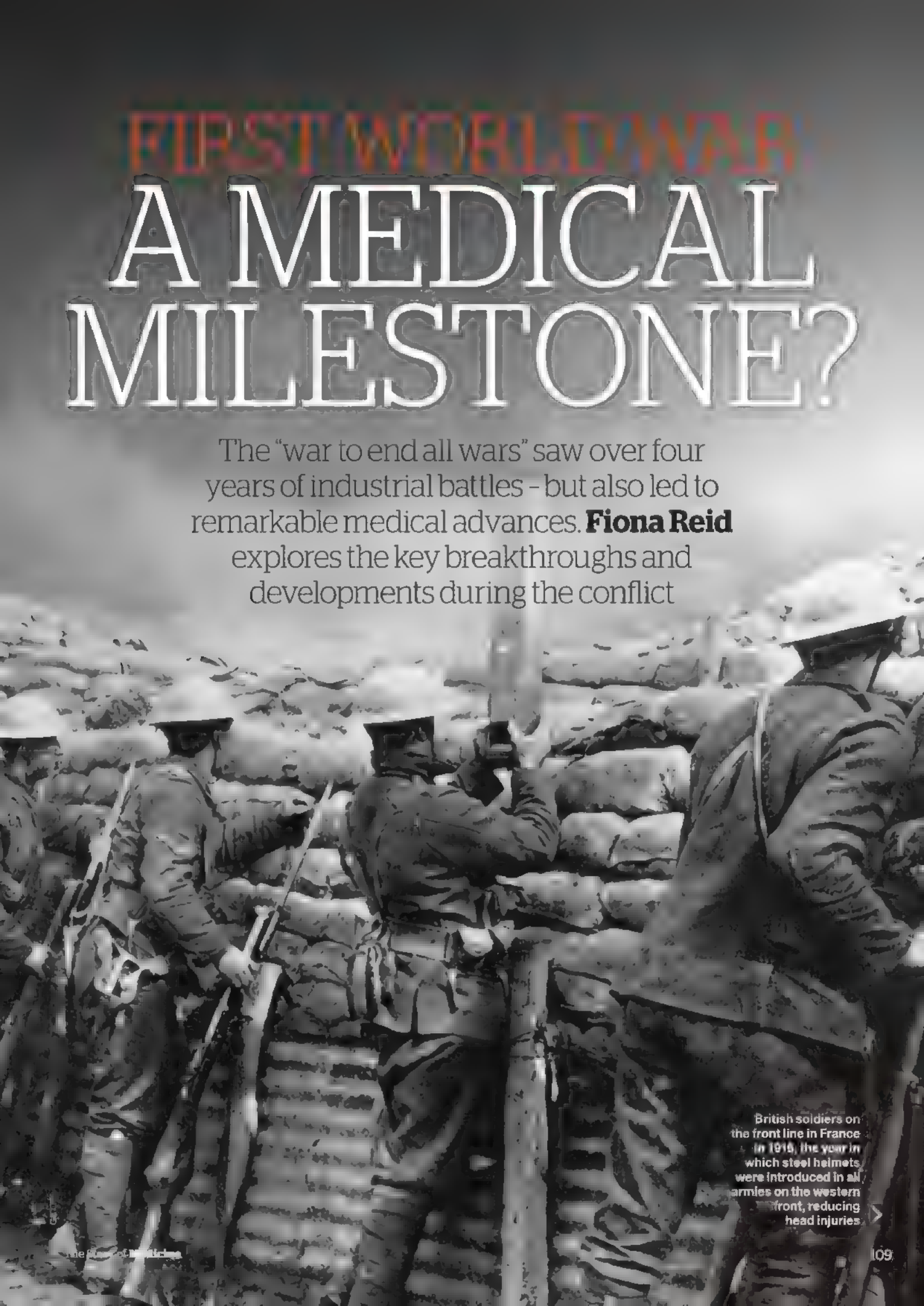
*Words: Eugene Byrne*

GETTY

FIRST WORLD WAR

# A MEDICAL MILESTONE?

The "war to end all wars" saw over four years of industrial battles – but also led to remarkable medical advances. **Fiona Reid** explores the key breakthroughs and developments during the conflict



British soldiers on the front line in France in 1915, the year in which steel helmets were introduced in all armies on the western front, reducing head injuries

A worker uses a prosthetic arm in 1916. In the First World War many combatants survived injuries that in previous conflicts might have killed them, resulting in larger numbers of disabled veterans

GETTY

"The Doctor has made this world struggle probably one of the least deadly ever fought in proportion to the numbers engaged ... of the wounded who survive six hours, 90% recover, and of those who arrive at the base hospital, 98% get well ... the medical man has the privilege of being called upon by the State to serve his country by the exercise of the science and art in which he has been brought up."

In January 1917 an editorial in the *Lancet* praised doctors for their role in the war – a view that was widely shared. Not only were doctors exercising their "science and art" but the war was giving them unprecedented opportunities to experiment and to progress. The war is "a great clinical trial and laboratory" declared Woods Hutchinson, an American physician who celebrated the "triumph of the doctor" in 1918.

Certainly, the First World War was a doctor's war. The French and German governments mobilised all of their doctors on the outbreak of the conflict; in Britain the Royal Army Medical Corps called on thousands of civilian doctors from the homeland and its empire as well as additional volunteers from the US. Did this medical mobilisation lead to medical advances? Or is the relationship between war and medical progress more problematic?

Most medical officers were mainly concerned with disease and sickness in the trenches. "Disease not battle digs the soldier's grave," announced William Osler, professor of medicine at Oxford University. In their rough wartime living conditions soldiers contracted coughs, colds and bronchitis, as well as a range of minor skin complaints, primarily scabies, boils and carbuncles.

## Trench fever

More seriously, soldiers suffered from trench fever, a term named for that type of warfare on the western front but endemic throughout all theatres. Initially categorised as 'Pyrexia of Unknown Origin', the condition was first recognised in 1915. The initial symptoms, similar to those of influenza, included headaches, shivering, sweating, constipation and abdominal pain. Later, men complained of pains in the lower back and the shins, and suffered relapsing fevers that could last for four to six weeks.

By 1916 it was clear that inoculation would not be an effective intervention.

Soldiers check their uniforms for body lice, which carried trench fever

Doctors suspected that lice were directly responsible for trench fever, but definitive proof was not found until 1918 when the US medical services established that the disease was caused by a specific virus carried by the ordinary body louse. All men in the trenches carried lice; they were constantly scratching the bites and thereby rubbed excreta into their skins, transferring the virus directly into the bloodstream.

Medical officers realised that the best way to deal with trench fever was through effective sanitation. Troops were regularly sent to de-lousing centres where they washed in big bathhouses and their clothes were either steamed or soaked in cresol soap and Lysol antiseptic disinfectant. This was an enormous logistical exercise, but the extent of trench fever forced the army medical corps to recognise the importance of hygiene and preventative medical care. It also raised a wider issue about healthcare amongst civilians. A poor medical history rendered a soldier more vulnerable to trench fever – nearly 20 per cent were physically unfit when they contracted the disease – making it clear that military and civilian healthcare were inextricably linked.

Dirt and disease are as old as war but industrialised trench warfare produced new and horrific injuries. Men faced machine guns, bombs, shrapnel, flamethrowers and rapid artillery fire, all of which caused desperate injuries to the face and head. Steel helmets, introduced in all armies by 1916, offered a level of protection but men continued to suffer terrible injuries to their heads and faces throughout the war.

Industrial warfare **wreaked violence on men's limbs as well as their faces**, resulting in an increased demand for orthopaedics

In January 1916 Captain (later Major) Harold Gillies responded by establishing a facial surgery unit at Cambridge Military Hospital in Aldershot. This unit soon became overwhelmed, especially after the battle of the Somme, and Gillies then transferred to Queen Mary's Hospital in Sidcup. Troops from Britain, Canada, Australia and New Zealand were sent to Sidcup for facial surgery; they were attended there by a surgical team from Britain, Canada, New Zealand and the US, and the surgeons also consulted French experts. In this case, as in many others, the medical advances of war were promoted as much by international co-operation as by the sheer demands of battle injuries.

Gillies' work rested on recognising the importance of repair rather than replacement, and of working slowly, because rapid and extensive surgery produced swelling, suppuration and scarring. He aimed to allow normal tissue to replace itself where possible, and he avoided using foreign implants, which ran the risk of being rejected – a serious matter in the days before antibiotics. Instead, he used grafts taken from the patient's own body.

Gillies is perhaps best remembered for his 'tube pedicle', a procedure that allowed him to transfer skin from one part of the body to another with little risk of infection. One Australian patient wounded at the battle of the Somme suffered serious damage to the jaw, nose and lips – his face was almost blown away by shrapnel damage. When he arrived at Aldershot for treatment six days later, Gillies took a flap of skin from the patient's chin and affixed it to the man's lip; the new skin on the lip was then trained upwards so that it could be used in the repair of the nose.

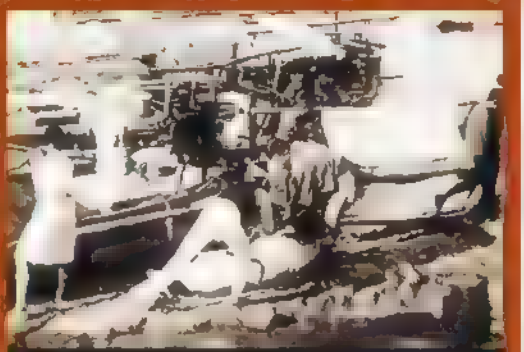
Plastic surgery progressed remarkably throughout the war, and men who would not have survived previous wars did so in this one. Nevertheless, the surgery was arduous and Gillies' notes are peppered with men who "refused further treatment".

Industrial warfare wreaked violence on men's limbs as well as their faces, resulting in an increased demand for orthopaedics. Before the war orthopaedic specialists had mainly treated what were then referred to as 'crippled' children. By the early 20th century more attention was paid to the victims of industrial accidents, but only those covered

## Three more wartime advances

### Treating gunshot in the Italian War (1536-38)

### Front-line surgery in the Russo-Japanese War (1904-05)



Wounded Japanese soldiers are evacuated during the Russo-Japanese war

### 'Flying ambulances' in the French Revolutionary Wars (1792-1815)

A soldier is treated at a dressing station in 1917. The introduction of innovations such as the Thomas splint greatly reduced mortality rates

by the National Insurance Act of 1911 were likely to receive treatment. Yet the wartime advances were based in civilian practice, and demonstrate the strong links between civilian and military medicine.

### 'Tommies' for Tommies

The Thomas Splint, one of the most celebrated wartime developments, was first used with poor disabled children in the 1880s, and was introduced into the trenches in 1916. Medics could apply these splints – affectionately known as 'Tommies' by the Tommies – in minutes without removing a soldier's clothes or moving him. This reduced the need for anaesthetic and minimised further injuries during transport – a really crucial factor given the difficulties of moving men out of the trenches and through the mud and the craters of the western front. As a result, the mortality rate from fractures dropped dramatically, from 80 per cent in 1916 to 20 per cent by the end of the war.

As with facial injury, a high number of men survived the sort of limb wounds

GETTY BRIDGEMAN

ALAMY

that would have killed them in previous wars, producing a large number of disabled veterans, many of them amputees. This in turn prompted a rapid improvement in the design of prostheses as the demand for artificial arms and legs reached unprecedented proportions. Some of these were specifically designed to enable men to remain part of the industrial labour force. They looked nothing like limbs but were instead devices that physically linked men to industrial machinery. Others were designed for a more aesthetic function, enabling a man to 'pass' as whole. The *Handbook for the Limbless* (1922) proudly promised a "Victory Over Empty Sleeves" for those who purchased Steeper 'ideal' arms – "a real advance in artificial arms".

All of these wartime advances were real, and they benefitted the war wounded as well as later generations. Nevertheless, it is too simplistic to attribute these advances to the war alone. The work on trench fever simply reinforced pre-war arguments about hygiene, diet and good health. Gillies' work laid the foundations for modern plastic surgery but, as he acknowledged in 1920, the techniques themselves were not new and "the principles laid down by the fathers of plastic surgery are found still to be of general application … There is hardly an operation – hardly a single flap – in use to-day that has not been suggested a hundred years ago." Orthopaedics did progress during the war, and the British Orthopaedic Association was formed in 1918, but this development was based on long-established civilian practice; progress halted with the armistice, after which most orthopaedic surgeons went back to working with disabled children.

Medics could **apply a 'Tommy' splint in minutes** without removing a soldier's clothes or moving him

Possibly the biggest advances in First World War medicine were those associated with political will and popular expectation. The Ministry of Health was established in 1919, and the men and women who had endured over four years of industrial warfare came to believe that healthcare was a right, not a privilege. A state with the power of mass mobilisation also had the responsibility for mass healthcare. After the Second World War the argument was irrefutable, and in 1948 the National Health Service was established. The NHS, the direct result of two devastating world wars, was the single biggest advance to stem from the extreme violence and 'total wars' of the 20th century.

**Fiona Reid** teaches modern European history at the University of South Wales. Her latest book is *Medicine in First World War Europe: Soldiers, Medics, Pacifists* (Bloomsbury, 2017)

Gareth Williams on... **The importance of the history of medicine**

# "The key players in the development of the polio vaccine were not saints – they were egotists with a Machiavellian streak"

The past had little impact on me while I was training to be a doctor. The history of medicine barely featured in the curriculum, and just a few random snippets lodged in my memory.

Among them was the fact that diabetes was called 'mellitus', from the Latin meaning 'tasting of honey', to remind us how the ancients distinguished it from other afflictions that caused excessive urination. I also recalled that before antibiotics, syphilis was treated with mercury salts that had more side effects than therapeutic benefit – hence the pointed question: "Is one night with Venus worth a lifetime with Mercury?" And I knew that the visionary who struggled to persuade surgeons to wash their hands between the post-mortem room and the delivery suite had ended up in a lunatic asylum.

So the history of medicine seemed all the more thrilling when I stumbled across it – rather like seeing the world more vividly after a cataract extraction. During a no-strings sabbatical year I chose to research the work of Edward Jenner, partly because I happen to live a few miles from the house where he experimented with vaccination. In no time, I was hooked by the story of smallpox and mankind's battle against it.

In mainstream science, the hard fact trumps everything else, no matter who reported it or how they got there. But the wider-angle lens of historical enquiry shows a much richer and more interesting picture, with glorious blunders, blind alleys, misinterpretation and fraud. There are also ample reminders that science and medicine are driven forward by people with flaws, frailties and prejudices just like the rest of us.

Our impressions of the great figures of medical history often turn out to be misleading. Take Edward Jenner, star of the extraordinarily colourful cast of the story of smallpox. Jenner's greatest strength was as a field naturalist: he was made a Fellow of the Royal Society for working out how a blind cuckoo chick clears the nest of its competitors. In medicine he was less organised, and left a string of unfinished experiments that could have been better written up.

Jenner also believed that his vaccine was perfect, and that a single dose conferred lifelong protection against smallpox. So he was publicly opposed to re-vaccination, even when it became obvious that some people vaccinated in infancy contracted and died of smallpox in adult life. By the end of his life, Jenner knew that his invention had saved millions of lives – yet, indirectly, his dogmatism had caused thousands of deaths.

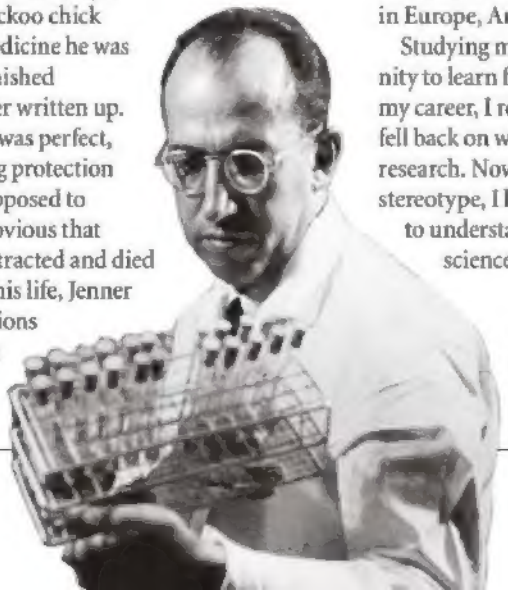
**Gareth Williams** is emeritus professor and former dean of medicine at the University of Bristol. He is the author of *Angel of Death: The Story of Smallpox* (Palgrave Macmillan, 2010) and *Paralysed with Fear: The Story of Polio* (Palgrave Macmillan, 2013)

The development of polio vaccines was one of the undisputed pinnacles of 20th-century medicine, but the key players were not saints; on closer inspection, they were egotists with a Machiavellian streak. And the successful vaccines followed a 20-year moratorium on research in the field imposed by Simon Flexner, the Director of the Rockefeller Institute in New York, who had a stranglehold over medical research in the USA. Flexner believed – wrongly – that the poliovirus entered the nervous system through the nose. During the 1920s he had tried (and failed) to make a polio vaccine, and so decided that nobody else could possibly succeed.

The main villains of medicine are, of course, diseases – many of which easily outstrip the brutality of human dictators. The Black Death, Spanish flu and smallpox each claimed many tens of millions of lives. Smallpox, which hlped wipe out the Aztecs and Incas, killed 250 million people during the 20th century before being eradicated by vaccination. And this is a storyline that will not run dry. The mass murderers of the past are being replaced by new threats such as AIDS, Ebola and Zika, not to mention dementia and obesity.

Finally, medical history provides countless examples of how poorly we learn from our mistakes. Time and time again we see the victory of bad medicine and bad science, for reasons that include ignorance, disinformation and dishonesty – and the failure to get the messages of good medicine across convincingly. The botched imposition of the English Vaccination Acts during the mid-19th century spawned the anti-vaccination movement, which confirmed the blindingly obvious: even the best vaccine will not protect those who decide not to take it. Tragically, this piece of history continues to repeat itself, with the return of measles and whooping cough following fake-news campaigns to discredit the vaccines that had all but wiped out these infections in Europe, America and Australia.

Studying medical history has given me the opportunity to learn from my own mistakes, too. Earlier in my career, I regarded history as something that doctors fell back on when they were too old to do 'proper' research. Now that I'm at risk of reinforcing that stereotype, I have one big regret – that I took so long to understand that history is crucial to both the science and the art of medicine. ■



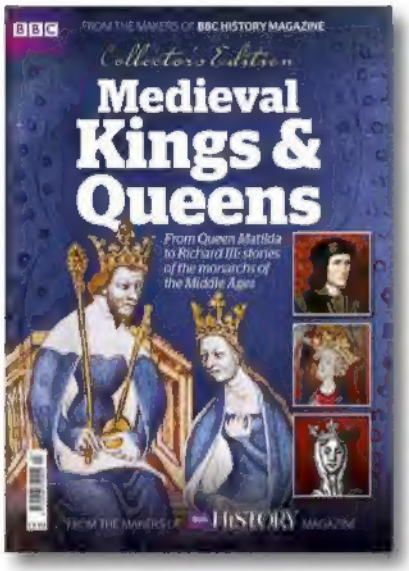
**Jonas Salk, who developed the first effective polio vaccine, which was officially launched in 1955**

GETTY IMAGES

# Collector's Editions

## FROM THE MAKERS OF BBC HISTORY MAGAZINE

**ONLY £9.99 EACH WITH FREE UK P&P***



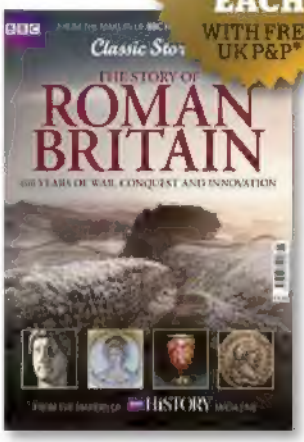

**New for 2017**

### Medieval Kings & Queens

Trace the tumultuous history of Britain's medieval monarchs from the Norman conquest to Richard III's fall at the battle of Bosworth. Meet rebellious queens Isabella of France and Eleanor of Aquitaine, warrior kings Edward I and Richard the Lionheart, and Welsh prince Owain Glyndŵr.

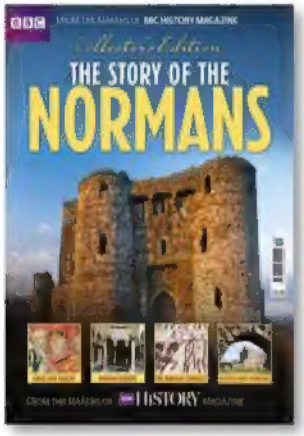

### The Story of the Victorians

Delve into one of the most fascinating periods in British history and discover the lives of a wide range of Victorians.




### The Story of Roman Britain

From first invasion to the eventual abandonment of Britain by Rome, explore battles, tribes, and everyday life under imperial rule.

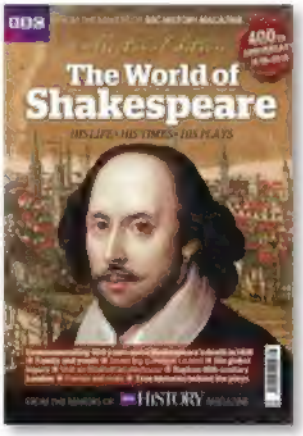



### The Story of the Normans

Marking the 950th anniversary of the 1066 battle of Hastings, this collector's edition traces the Normans' journey from Viking raiders to rulers of England.

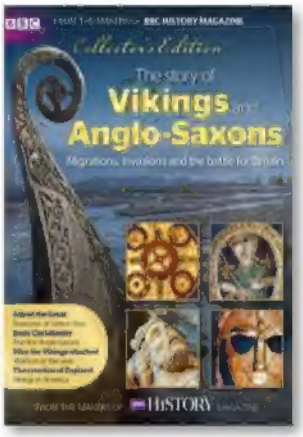

### The World of the Georgians

This collector's edition explores the lives, politics and conflicts of the Georgian age, from the ballrooms of elite society to life in Nelson's navy.




### The World of Shakespeare

Explore the life and times of the famous playwright, tracing England's social and cultural history, and find out about his enduring legacy to the world.




### The Story of Vikings and Anglo-Saxons

Discover the origins of the Anglo-Saxons and Vikings and find out how they battled to dominate the British Isles.

**Order online www.buysubscriptions.com/historyspec or call us on 0844 844 0250+ and quote HISTSPEC**

+ Calls will cost 7p per minute plus your telephone company's access charge. Lines are open 8am-8pm weekdays & 9am-1pm Saturday.
* Subscribers to *BBC History Magazine* receive FREE UK postage on these special editions. Prices including postage are: £11.49 each for all other UK residents, £12.99 each for Europe and £13.49 each for Rest of World. Please allow up to 21 days for delivery.

*Collector's Edition*

# THE STORY OF MEDICINE

***"Science and medicine are driven forward by people with flaws, frailties and prejudices just like the rest of us"***

Historian Gareth Williams on the importance of studying the history of medicine

FROM THE MAKERS OF BBC HISTORY MAGAZINE